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THE first cost of applying air brakes to freight cars has been very large, but its advantages are so fully understood that no one would for a minute question the advisability of having the cars so equipped. It is rather surprising, however, that after applying such an expensive apparatus so many of the roads fail to appreciate the necessity of seeing that it is maintained in such a condition as to insure a high degree of efficiency in service—and this is all the more important, since long heavy trains have become so common. That careful attention to the upkeep and condition of the air brake apparatus will be amply repaid is indicated by the paper on "Undesired Quick Action," which was read before the Air Brake convention at St. Louis on Tuesday morning, and which is reproduced in another part of this issue. The actual damage to the cars by such failures is important, but not nearly so much so as the resulting delay to the movement of trains and the added cost of wages for the train and engine crews. The draft gears, underframe, and superstructure of freight cars have been greatly strengthened in recent years to guard against failure, but it will be folly to carry this beyond a certain point, because of the added weight of the equipment. Every reasonable means should thus be taken to guard against failure of the air brakes and the abuse of the equipment.

THE Interstate Commerce Commission has made a good start in forming its organization for the valuation of railways. It is announced that the work will be in general charge of Commissioner Prouty. Five of the engineers who are to have charge of the engineering work have been selected. They are R. A. Thompson, W. D. Pence, J. S. Worley, Howard M. Jones and Edwin F. Wendt. Mr. Thompson is now chief engineer of the California commission, and was formerly chief engineer of the Texas commission. The fact that he was formerly connected with the Texas commission is not apt to give railway officers a favorable opinion of his fairness, but his attitude at times was decidedly more fair than that of the commission. Mr. Pence has been professor of railway engineering of the University of Wisconsin and chief engineer of the state commission for seven years, and has had charge of the commission's valuation work; and the Wisconsin commission's valuations, as well as its work as a regulating body in general, have usually been ably and fairly done. Mr. Wendt has been in railway service throughout his active professional career, is assistant engineer of the Pittsburgh & Lake Erie, and was this year elected president of the American Railway Engineering Association. His election as president of this great engineering organization is a sufficient indication of his standing as a railway engineer. Mr. Worley is a consulting engineer at Kansas City, and Mr. Jones a consulting engineer at Nashville. It is announced that an army engineer also probably will be appointed. If the rest of the personnel of the commission's organization is as good as the part already announced it will command and deserve the confidence of railway managers and the public.

THE mechanical department officers of a trunk line were surprised to find a number of years ago that the engine failure records showed a greater number of failures during the hot summer months than during the winter season. Special efforts had always been made to prevent failures during the severe winter weather and the men were kept keyed to a high pitch in their efforts to reduce them to a minimum. When the warmer weather set in and the elements were more favorable, the men gradually relaxed in their efforts to prevent failures and accidents. Special steps were made to overcome this tendency and as early as January and February the officers started to emphasize the necessity of guarding against failures when the warmer weather set in and the operating conditions were more favorable. The results were remarkable; the failures were very much less in number than for a corresponding period during the previous years. The same thing is undoubtedly true of accidents, and those who are in charge of "safety first" movements and boiler inspection will do well to agitate this matter at the present time with a view of reducing such accidents during the coming summer. In this connection the number of accidents reported to the division of locomotive boiler inspection of the Interstate Commerce Commission for each month during the year ending June 30, 1912, is of interest.

1911.		1912.	
July	100	January	70
August	92	February	73
September	52	March	81
October	68	April	51
November	64	May	74
December	58	June	73

These figures must not be taken as conclusive, because it is quite probable that due to misunderstandings the railroads did not report all of the accidents that they should when the law first went into effect in 1911. It would appear, however, that the

number of accidents during July and August is considerably higher than for the other months of the year, and it will be interesting to see whether this condition still exists when the next annual report is made.

THE LABOR LOBBY.

ADMIRATION for the ingenuity of the legislative lobbies of the labor brotherhoods in devising bills to strengthen the position of labor in dealing with the railroads, and for their skill in getting legislatures to pass them, grows apace among those who follow their activities. No argument based on facts, reason or the public welfare has been sufficient to keep numerous legislatures from passing, and governors from signing, train crew bills. The demonstration that practically their only effects were to increase the number of employees and the amount of the operating expenses of railways has been impotent when it has encountered the argument that the labor organizations have the votes. These ingenious and skillful lobbyists are also actively pushing other classes of bills which are equally pernicious. One class of them is designed to make it impracticable for the railways to get men to fill the places of those who quit in case of strikes. These usually take the form of requirements of a specified length and character of experience as a prerequisite for holding certain positions. They are put forth as measures to promote safety, but their real purpose is to prevent the railways from resorting to the employment of strikebreakers.

Just how sincere is the solicitude of the brotherhoods' lobbies for safety is indicated by recent experience with a measure to prohibit trespassing in Texas, where, as elsewhere, a large majority of all the people killed on railways are killed while trespassing. It had been thought the bill would pass. Then some influence suddenly caused a loss of interest in it, and it was shelved. Inquiry developed the fact that the brotherhoods, whose support had been counted on, had instead offered opposition. Their *volte face* was caused by the discovery that, as, in case of a strike their members would cease to be employees, under the proposed legislation they would lose their right of access to railway property, which might hamper some of the ingenious practices resorted to where strikes are on, such as throwing emery dust into the bearings of a locomotive, or soap into the boiler!

Another example of the brotherhood lobby's interpretation of "safety first" is afforded by a bill recently introduced in the New Jersey assembly, providing that where tests of apparatus are to be made in connection with the operation of trains previous notice shall be given in writing to the engineman. This would effectually stop "surprise tests" to determine if signals are being obeyed, by taking out the "surprise." Such tests have proved one of the most effective methods of preventing accidents, because they cause employees to be careful in the observance of signals and orders, and if it be considered desirable to stop them a much better and safer method than that provided by this bill could be adopted. This would be to require enginemen and other employees to give railway operating officers notice in writing when they are going to disobey a rule, order or signal.

The effective power of reiteration and continuous pressure has undoubtedly assisted the passage this year of some of these so-called safety bills that in past years have aroused little interest among the legislators. According to press reports the brotherhoods are knocking at the doors of the California assembly with a bill of a kind which appears to be new. It provides that railways before "docking" or discharging an employee for wrongdoing or violation of orders on the evidence of "spotters" shall give the accused a chance to reply to the "spotter" face to face. This opprobrious word "spotter" is simply a synonym for detective. The railways, in the interest of good discipline, have found it necessary to employ detectives to learn whether their conductors are collecting and reporting fares properly and whether their engineers are drinking, just as they have found it necessary to conduct surprise tests to make signal indications effective, and just as the government finds it necessary to employ inspectors and examiners to see that the railways themselves obey the laws passed to regulate them. Naturally "spotters," detectives and examiners are not popular in railroading or elsewhere. The honest, careful man resents espionage, and the dishonest or reckless one resents it even more. As the "spotter" is employed on only a single road he must work incognito to be of any value. Even under present conditions the men are apt to identify him, when it is necessary to transfer him to some other division or discharge him entirely. If required to support his charges openly he would become a marked man. The spotter once spotted would not longer spot with success. He would be about as valuable to his employer as the surpriseless surprise tests provided for in that New Jersey bill.

Bills such as those in New Jersey and California here referred to are extreme, but they are hardly worse than many measures which have been promoted by the labor lobbies in the past and actually passed by legislatures. The railway employees of the United States rank above the average of our citizenship in intelligence, sobriety and public spirit. Many persons doubtless have wondered why they support measures, few of which are meritorious, most of which are against the public interests, and some of which are almost idiotic. A very large proportion, and probably a majority, of the members of the brotherhoods really do not favor the legislation pressed in their names. But labor policies, like political policies, are dictated by the most active and aggressive, not by the most numerous, and once they have been decided on a brotherhood member who opposes them finds things disagreeable for him, if he does not lose his brotherhood membership. The kind of methods used by the labor lobbies to get the measures they favor passed is indicated by the following from a statement issued by the lobby at Springfield, Ill. on May 3 and published in the morning newspapers of May 4:

> International officers of the railroad men are on their way to Illinois to assist the representatives (in other words, the lobbyists) in their attempt to persuade the lawmakers to "do it now." . . . The proposed law known as the full crew act is in the Senate sub-committee. The Brotherhood of Railroad Trainmen has more than 10,000 members in the state and is backing the measure. For a second choice they will support a car limit bill for freight trains, and as this will appeal to the public it may be the compromise decided upon. . . . The situation is increasing in tenseness every day. A few railway employees are trying to ride the top rail of the fence and still touch ground on either side. *These the railway brotherhood officers are threatening with dire penalties for insubordination.* (The italics are ours.) A. D. Burbank, representing the trainmen's union, speaks very hopefully of the outlook, and, as he is one of the big five—Culp of the Engineers', McCarthy of the Firemen's, Carroll of the Conductors' and Connors of the Switchmen's—besides having the united support of the American Federation of Labor, the prospects of several measures backed by the united labor lobby seem to be very good. "If we don't get a part of our proposed legislation there will be 20,000 railroad men on the warpath in this state," said Mr. Burbank, "and they won't be after me, either."

The meaning of this is quite clear. First, the labor lobbies do not deny, but flaunt, their activities. Second, members of the brotherhoods who oppose legislation favored by them are threatened with dire punishment. Third, the lobbyists represent—or represent that they represent—several thousand votes, and will see that they are used against legislators who don't vote for the legislation the lobbyists demand. It is notable that there is not a syllable in the statement to indicate that it is even pretended that the bills being backed by the lobby are being pressed in the interest of the public welfare. Every one of them, if passed, would increase railway expenses, not for the benefit, but in the long run, to the detriment, of the public. In view of this fact the question arises as to why there has been so much agitation against lobbyists representing railways and other corporations, while so much tolerance is accorded to lobbyists representing railway brotherhoods. Certainly there is significance in the difference between the reception accorded in these days of reform to labor lobbyists with votes at their back and to representatives of railways with nothing but arguments to offer.

The railways formerly sometimes protected themselves against unfair legislation by buying up strike legislators with passes and

cash. They recently have been trying to prevent such legislation solely by publicity and fair arguments. These honest and decent methods have in many instances proved ineffective when matched against the railway labor lobby backed by organized voting strength. Is it possible that developments are going to prove that those are right who contend that the only weapon corporations can use effectively against the bribing power of organized votes is the bribing power of cash? The universal presence of the labor lobby, and the results it has been getting are some of many striking evidences of the degraded level to which American state legislatures have sunk, in spite of all the reform talk and agitation of recent years.

PROPOSED RATE ADVANCES ON EASTERN ROADS.

IN its decisions two years ago denying the general advances in rates the railways then sought, the Interstate Commerce Commission intimated that if changes in conditions showed the railways really needed larger earnings it would let them take the action necessary to secure them. It is now announced by President Willard of the Baltimore & Ohio that the eastern roads will soon ask the commission to permit an increase of 5 per cent. in all their freight rates.

A good many things have happened within the last two years which affect the situation of the railways, and which may influence the attitude of the commission. The net operating income per mile of the railways of the entire country in the year ended June 30, 1910, was the largest in history. The commission referred to this in its decisions, and expressed not only the hope, but the opinion, that they would be still larger the next year. The opinion expressed proved incorrect; the hope was not realized. Operating income—which is what the carriers have left after paying expenses and taxes—was less in the fiscal year 1911 than in 1910, and less in the fiscal year 1912 than in 1911. In its annual report for 1911 the commission made comparisons between the earnings of railways operating 239,483 miles in 1910 with the earnings of the same roads in 1911. The operating revenues of these roads declined from $11,636.21 per mile in 1910 to $11,588.19 in 1911, and their net revenue from outside operations from $11.09 per mile to $8.52 per mile. Meantime, their operating expenses increased from $7,711.19 per mile to $7,957.56 per mile and their taxes from $437.70 per mile to $448.58 per mile, causing a decline in operating income from $3,498.41 per mile to $3,191.36 per mile. As to the eastern group of railways, the same report showed that the operating income of those earning more than $10,000,000 per year declined from $299,591,499 in 1910 to $266,623,158 in 1911, although the mileage included in 1911 was over 500 miles greater than that included in 1910. In its annual report for 1912 the commission gave some comparative figures for 1911 and 1912. These, instead of relating to practically all the railways of the country, covered only those earning in excess of $1,000,000 per year. The operating revenues per mile of these roads, whose mileage in 1912 was 219,373 miles, increased from $12,547.33 in 1911 to $12,601.14 in 1912. Meantime their net revenue from outside operations decreased from $5.82 to $2.22; their operating expenses increased from $8,603.16 to $8,707.82; taxes increased from $484.21 to $532.92; and their operating income decreased from $3,465.78 to $3,362.62. The same report shows that between 1911 and 1912 the operating incomes of railways in eastern territory earning more than $10,000,000 gross increased from $268,233,349 to $273,449,158, while meantime their mileage increased over 750 miles; this increase was far too small to offset the decrease in 1911.

It will be seen that the reductions in the net revenues of the railways have been chiefly due to increases in their operating expenses; and, of course, the increases in operating expenses have been chiefly due to increases in wages, with which the country is familiar. Some of the largest wage increases were made in 1910, but did not produce their full effect on expenses until 1911. Among those occurring in 1910 were the increases in the wages of conductors and trainmen, concerning which the president of the Brotherhood of Railroad Trainmen said in his report to the tenth biennial convention of that organization, "Conservatively estimating, the increases in the pay of conductors, trainmen and yardmen in the East as a result of this movement will approximate $30,000,000 per annum." The wages of engineers have been increased since then; increases in the wages of firemen are going into effect; and now the Brotherhood of Railroad Trainmen is back asking for additional increases in the wages of its members which, it is estimated, would amount to $17,000,000 per year.

Some other causes also have operated strongly to increase the expenses of many roads. Among these have been the extreme weather of the winter of 1911-1912; and the violent and widespread floods of the springs both of 1912 and 1913. It may be said that these conditions were but temporary; but the railway business is a peculiar business in which "emergencies" and "special conditions" are constantly developing, and in which, therefore, if the properties and service are to be kept up, provision for "emergencies" and "special conditions" must constantly be made in the form of earnings. The increases in taxes, as figures given above indicate, have been equally formidable in proportion. For 239,483 miles of line taxes amounted in 1910 to $104,821,374.70. or $437.70 per mile. For only 219,372.87 miles they amounted in 1912 to $116,909,458.76, or $532.92 per mile. There has been a change in the tendency of earnings since the beginning of the present fiscal year. In the eight months ending February 28 the total operating revenues of the railways of the country earning more than $1,000,000 a year increased 10.2 per cent.; the total operating expenses 9.1 per cent.; taxes 5 per cent., and operating income 13.9 per cent. In eastern territory the increases were, in operating revenues, 10.7 per cent.; in operating expenses, 10.8 per cent.; in taxes, 3.5 per cent.; in operating income, 11.3 per cent. But since the period covered by these increases the eastern roads have experienced the bad floods which have cost millions; advances of wages have been granted to their firemen, and the legislatures of a number of states have been passing "full crew" and various other laws tending to increase operating expenses. Furthermore, it will be noticed that the percentage of increase in operating expenses in eastern territory, even during the months of the present fiscal year preceding the floods, was slightly greater than the percentage of increase in operating revenues. The showing made during these eight months as compared with the same months of last year is distinctly better than will be the showing made during the entire fiscal year, as compared with the last fiscal year.

Return on capital must, of course, be paid from net operating income. While net operating income was decreasing in 1908 and 1909 as compared with 1907, and in 1911 and 1912 as compared with 1910, the demands on it were increasing. The rate of interest that railways as well as other concerns must pay has continued steadily to advance. A few years ago old railways with good credit could borrow capital at 3 to 4 per cent. The Baltimore & Ohio is an old road in the heaviest traffic territory in the country; it is now exceedingly well managed; yet when it recently made an issue of bonds it had to fix the interest on them at 4½ per cent. and even then could not get par for them. Other strong railways that have tested the market either to refund old obligations or to raise new capital have had even worse success. As to stocks, some of the most reliable 6 per cent. dividend payers are quoted only around par, and others proportionately much lower. A new issue usually depresses the market; all of which means that few even of the strongest railways could issue stock on a 6 per cent. basis. While the railways meet such difficulties, and even impossibilities, in raising capital at rates which they can afford to pay, the public need for them to make improvements and extensions for which the raising of new capital is necessary grows more imperative. There was a congestion of traffic and a large car shortage last fall; and the situation would have been worse if weather conditions had not been almost ideal for handling business in the fall and far into the winter. The car shortage of 1912, though relatively small, was

warning to prepare against a large one like those of 1906 and 1907. Extensive and costly improvements also are needed to make the railways as safe as the public welfare demands.

When the question of rate advances is presented to the Interstate Commerce Commission the point whether the railways are as economically operated as they should be may be raised again. Clearly, however, the burden of proof will be on those who may charge that this is not the case; and if ever there was a time when they could not sustain that burden the present is that time. In the railway, as in nearly every other industry, there are concerns that are not as well managed as they might be. But it is certain that never in the history of the railway industry in the United States have the railway managers as a whole tried harder to operate economically than during the last two years. They cannot be blamed for the principal increases in expenses, namely, the advances in wages, as they have strenuously opposed every one of them, and have made only those held to be reasonable by arbitration boards, most of them organized under the Erdman Act. Congress recently has passed a law providing for a valuation of railways, the main purpose of which is to ascertain whether the earnings of the railways are reasonable. It will be several years before this valuation is completed. It would seem, therefore, that the rate question should be decided for the present regardless of the valuation matter. The commission has been able to decide without the aid of a valuation that many rates were too high. Doubtless it will continue to be able to do so between now and the time the valuation is finished. If it can determine without the aid of a valuation that rates are too high, it can also determine without the aid of a valuation whether they are too low.

The advances proposed differ in a very important respect from those proposed a few years ago. The eastern roads then tried to advance class rates and some commodity rates, the argument made being that not only did the railways need more money, but that the rates in question were too low compared with other rates. The new plan is that all freight rates shall be advanced 5 per cent. Which of these plans is the more equitable depends on whether the existing relationships between rates in general are or are not fair. The commission by refusing to permit advances in specific rates in the previous case, and by its work of adjusting the relationships between rates over a period of many years, is almost estopped, it would seem, from holding that the present general relationship between rates is not fair. If the present general relationship between rates is fair, and the railways are entitled because they need more earnings to an advance in rates, then a proportionate advance in all rates would be the fairest. An advance of 5 per cent. in freight rates would increase the earnings of the eastern railways about $50,000,000 a year. The burden imposed upon shippers and consumers would be relatively small compared with the advantage that would accrue to the railways. Of course, however, the real question is not how little or great the additional burden imposed on shippers and consumers would be, but whether in the interest of the public as a whole it is desirable that the earnings of the railways should be increased by the means and to the extent suggested. It is inconceivable that if concerns in any other line of industry could make the same showing regarding proposed increases in their prices that the railways can make regarding the proposed increases in their rates, anybody would question the reasonableness of the proposed increases in prices.

RIGHT OF TRACK IN LARGE STATIONS.

STATIONMASTER STICE, of Terre Haute, Ind., has the courage of his convictions. When he sees a brakeman (of a passenger train) standing on the track in the trainshed of a union station (where all trains stop), holding a red flag in his hand, he thinks it looks foolish. He said so in connection with the investigation of a collision which occurred at Terre Haute last January, as reported in another column of this paper. Such protection, under such circumstances, looks foolish to many other people, also; and it will be worth while to consider the reasons for Mr. Stice's view.

The government report says that since the collision the Vandalia road has ordered that the flagging rule be observed in Terre Haute union station. The general practice at Terre Haute heretofore seems to have been the same as at most large trainsheds where the block system is not in force. Every movement was supposed to be made with speed under control, and flagging was neither required nor carried out. But, if Mr. Belnap's report gives all the facts, the specific fault was that this practice was based on tradition and not on a formal rule; and therefore the engineman who came in at 20 miles an hour did not break any definite speed regulation. The relative rights of No. 8 and No. 20 at 1:42 p. m. on that piece of track are not clearly explained. Ordinarily, No. 8 arrives 10 minutes ahead of No. 20, and leaves 45 minutes behind it. If No. 8 is customarily set off to make way for No. 20 it has apparently no right to return to the main track until No. 20 has passed; or until its leaving time (1:45) has arrived. However, this question is not, perhaps, of much importance, except to show, by its peculiarities, the futility of trying to provide in a satisfactory way for movements at large stations except by one of the two simple methods; either the space interval system, constantly enforced, or the universal requirement that speeds shall always be under control.

Why does the spectacle of a man with a flag in a trainshed "look foolish"? For one thing, because not once in a hundred thousand times will a man performing such a function at such a place prevent a collision. Mr. Stice may not have formulated his thought in terms of percentages, but everybody will agree with him that a precaution which seems so needless always has been and always will be extremely difficult to enforce; so difficult, indeed, that the only rational course is to adopt some other means of protection. The best course is the block system. The New York Subways adopt that, even to the extent of introducing a block system in which the signals are located less than 150 ft. apart. But even without the block system flagging at a large station looks foolish. Everybody agrees, in principle, that responsibility should not be divided. Why do we not more generally adopt the principle? It is a reasonable rule that trains shall always be moved in a large station with speed under control and the whole responsibility be made to rest on the engineman. Such a rule has been in effect for years at many places. The report of the Terre Haute collision indicates that, in fact, it was in force there, though it was not in the book; and that the engineman who allowed himself to take a great risk when a cloud of steam fell across his path, would, on a moment's reflection, admit that he was breaking an important unwritten rule. He seems temporarily to have followed the unwritten rule of 40 years ago that nothing may ever get in the way of a fast express. According to the testimony concerning the practice in that trainshed, he must have known that a flag was never to be expected there, whatever the obstruction might be; and he would have to admit that a train, or a car or an engine might get in the way, even of No. 20.

Flagging at large stations looks foolish because usually it is so difficult to estimate what needs to be done in a given case. With speeds of all trains very low the flagman need not go far from his own train. He estimates how fast an expected train will be moving. If he be instructed not to give himself that liberty, then he must go the maximum distance that may be necessary for safety. This often means ten times farther than is really necessary in the particular case if the approaching engineman is on the lookout. But flagging, to be entirely adequate, implies the use of torpedoes in addition to the flag. The constant use of torpedoes cannot be tolerated in and around large stations, especially where there are street crossings as at Terre Haute; and so we come back to the standard rule, to protect "when the conditions require it." Many of the considerations here mentioned, or suggested, apply on the open road, as well as at large stations. In probably 99 per cent. of a passenger train's stops, the flagman need not start back inside of the first

30 seconds in order to comply with the rule; and in a large percentage of them he need not start within 60 seconds. In a good percentage probably he would be complying with the rule if he did not start for two minutes. But the individual flagman must himself decide these questions of seconds in each case, and, naturally, he gets down on the ground with his flag. Being in that position—not running back—he *seems* to be neglecting his duty; as he is if the conditions are such that he really ought to go back. That flagging often looks foolish—or, at least, illogical or inconsistent—will be generally agreed. And when our education is more nearly completed we shall agree that, although it is necessary in the absence of the block system, it is foolish as compared with the use of the block system. One well known railway manager, who used the block system throughout his line in 1885, said that it was "a crime" to run a road without it. That, perhaps, was extreme language, and he seems to have held views far in advance of his time; but how far?

The Terre Haute collision calls to mind numerous collision reports of 25 years ago, in England. The Board of Trade at that time had to secure the adoption of the block system by persuasion, the compulsory law not having been passed. Every now and then a collision would happen in a large station, and the investigation would show that, as at Terre Haute, the block system was in operation at all other parts of the road except in and near the station. The English inspector in his mild and cautious dignity would report that "the company are of opinion that they cannot work the block system in large terminals." Nevertheless they did finally do it. The difficulties, in reality, were small; but they were larger in some ways than they are now. At the present day the question of almost satisfactory signaling at a large passenger station is only one of money.

NEW BOOKS.

Steel Rails. By William H. Sellew, principal assistant engineer, Michigan Central Railroad, Detroit, Mich. Cloth, 550 pages, 7½ in. x 10½ in., 361 illustrations and 33 folding plates. Published by D. Van Nostrand Co., 25 Park Place, New York City. Price $12.50.

In view of the widespread discussion of the steel rail problem during the past two years, this book is most timely. It is a valuable addition to the literature of the subject with which it deals. Unlike most books treating of the rail problem, it is prepared more from the standpoint of the active railway man than of the metallurgist, and discussions of the intricate details of steel manufacture are written for men familiar with the subject only in a general way. The book is prepared upon a broad basis, and contains much valuable information regarding the important conditions affecting the service of rails.

In the first chapter the development of the steel rail is traced from the period of the iron rail to and including the adoption of the recent American Railway Association sections. The second chapter is devoted to the pressure of the wheel on the rail and analyzes the speeds and weights of modern locomotives and the effect of their motion, flat spots, etc., upon the rail. Photographs of and data regarding much of the recent equipment are also included. The third chapter discusses the supports of the rail, including reference to the more important concrete and metal ties. The fourth and fifth chapters are devoted to the stresses in and the strength of the rail, respectively, and are largely mathematical in their nature. There are 136 pages devoted to the influence of details of manufacture upon the rail; the chemical composition, mill practice, and other influencing factors all being discussed. In chapter seven are given comparisons of the leading American specifications with representative American and British specifications. The forms recommended by the Rail Committee of the American Railway Engineering Association for the various rail records are given in an appendix, with 33 plates showing standard rail sections, locomotive diagrams, and other important details.

The book should prove a valuable reference work for railway men interested in its subject. It is clearly printed on heavy paper with many excellent photographs and drawings.

The Special Law Governing Public Service Corporations. By Bruce Wyman, Professor of Law in Harvard University. Two volumes, 6¼ in. x 9½ in., 1517 pages. Published by Baker, Voorhis & Co., New York. Price $12.50 for the two volumes bound either in leather or buckram.

There was a time when the law pertaining to railways and other public service corporations was of interest only to their law departments. That time has passed. The public regulation of this class of concerns has come to exercise a controlling influence over their ideals and methods of management. The extent to which public regulation ought to be carried is a question of economics. The extent to which it has been and can be carried is one of law. Interest in the latter phase of the subject is no longer confined to the law departments. Those who are interested in it naturally are prone to seek knowledge about it. Therefore, there is a very large number of persons besides lawyers, who nowadays are more or less keenly interested in the law of public service corporations. Professor Wyman's elaborate work on this subject is intended primarily for lawyers. There is no doubt of its comprehensiveness and authoritativeness from the lawyer's standpoint. At the same time it will be found of value to all who are interested whether as lawyers, economists, business men, or statesmen, in the general subject of regulation of concerns devoted to a public service. Professor Wyman's writings, in other works as well as this one, show that while he is first a lawyer, he is also an economist and in the best sense of the word, a publicist.

In his preface Mr. Wyman dwells on the clear distinction between the laws of public and of private callings. He says, however, that as time goes on he finds himself among the conservatives. He believes that the state should as far as possible confine itself to regulation, "leaving the companies to work out their own problems of management. . . . There should be swift reparation provided for any individual who has suffered harm. . . . When the state goes farther and attempts to dictate as to the policies which the companies shall adopt it usually goes too far. Legislation going to this extent really crosses the line which divides state control from state operation. The next step would be government ownership with its unknowable consequences."

While Professor Wyman makes very clear the difference between the law of public and of private callings, he gives a much broader application to the former than many writers. He takes the position that "whether a business is public or not depends upon the situation of the public with respect to it"; that any business which becomes practically a monopoly becomes affected with a public interest; and that when this situation develops the industry becomes subject to the law of public service corporations, even though prior to the establishment of monopoly in it it was not subject to that law.

The work is too comprehensive to admit of anything approaching a thorough review of it here. Among the chapters which will be especially interesting to our readers are those dealing with the general subject of regulation of public service, which includes a discussion of the general theory of rate regulation, of the proper basis of capitalization, and of the rate of return on capital to which public utilities are entitled. The methods of fixing and regulating the rates of public utilities, including railways, are quite fully discussed; and chapters included in the general discussion of "Prevention of Discrimination" relate especially to railway rates. The last chapter deals with the constitutional phases of public regulation, and in the Appendix are given the Interstate Commerce Act, the act creating the Commerce Court, the Elkins rebating law, the Expedition Act, forms for proceedings before regulating commissions and forms for proceedings involving orders of commissions. The work is one which might well be given a place in the library of every lawyer, economist and journalist interested in the general subject of public regulation.

Letters to the Editor.

"BARGAIN FESTIVALS" AND OTHER THINGS.

Chicago, Ill., April 28, 1913.

To the Editor of the Railway Age Gazette:

The article printed in your issue of March 7 entitled, "When Accidents Are Not Accidental," and the reference to it in the editorial of April 4 should cause some managers to meditate a little. The cause of some causes of accidents is here clearly set forth. When general officers subvert the authority, and necessarily, also, the prestige, of the division officers, by reversing their decisions on discipline they set in motion a cause which surely has an effect. What is said in regard to unfit officials, and the resulting unfit men is equally significant. Mr. Brandeis could get a large part of his "million a day" saving out of this one leak.

"Superintendent," in his recital of the effect of frequent changes in managements, is true to life. I served in an official capacity on different western roads for several years. A management lasted from one to four years. Each manager had his followers, with which he filled the official positions, and a large per cent. of these men simply stayed to live, and lived to stay. Their chief interest seemed to be to hang on as long as their chief did. Happily, this condition has changed for the better; yet there is still room for improvement.

I served under one superintendent who was an old switchman and yardmaster. He could not see very much good in a man who did not at least appropriate a part of the vernacular of the tough switchman, including the "cuss" words, and who did not also have time to listen to him as he frequently expatiated on how he had handled great yards and terminals on other roads, and to laugh at his coarse and vulgar stories. I served under another who was an office man, and so aristocratic that he seldom got down close enough to the men to know what was really going on.

The practice of reinstating men dismissed for just causes should be abolished absolutely. This problem is strictly up to the managers. To get the best results the discipline should be as rigid as it is in the army.

On some roads at the present time the feeling among the men is that if worse comes to worst and a man is discharged, the local or general chairman of the brotherhood will get him back. It is obvious that in this situation the local railroad officers are greatly handicapped. As a matter of fact, the carelessly inclined element are taught by this very procedure that the trainmaster and the superintendent are too severe, or inconsiderate; or that they are incompetent. This is anything but an incentive to loyalty. General officers who have not had to deal with the rank and file, possibly for years, cannot be in touch with the many occurrences which demand the infliction of discipline; and even if they were, the basis of a punishment includes a man's past conduct and habits. A most serious mistake is made when they reinstate men on leniency pleas, or otherwise.

Exchanges which are made between the general officers of the brotherhoods and the railway managers in their annual adjustment meetings, when reinstatements are made and the employees' records are cleared of certain marks, to quiet or offset requests and demands for increases in pay and changes in working conditions, constitute a serious weakening influence. These bargain festivals have become so common on some roads, that when other means fail the men look forward more or less confidently to finally gaining their point at the yearly conference. In some quarters the men have succeeded so well that the word "discharged" is, to them, more or less of a misnomer. The brotherhoods have succeeded so well along these lines that they actually trump up grievances and make outrageous demands with no other end in view than effecting such deals.

I submit that a man not in the ranks, or in very close touch, can form only a very vague conception as to how this reinstating evil subverts the local officers' authority and prestige. Only the officer who has power, as well as character and ability, can win loyalty, and thus enforce discipline. Loyalty is a reciprocal proposition; only loyalty can win loyalty.

Unfitness of officers, which is one result of frequent changes in management, is alone responsible, more than any other thing, for the hold that the labor organizations have on the roads. This view is confirmed by the tight grip that the brotherhoods have on the roads where changes in management have been frequent. And this is perfectly natural. Frequent changes indicate a lack of stability; and stability is absolutely essential to good management.

Local Officer.

A REVERIE ON THE UNIT SYSTEM.

Texas, March 11, 1913.

To the Editor of the Railway Age Gazette:

It is not with an idea of criticising the unit system of operating railroads that I comment on it, as it is my opinion that if carried out in accordance with the ideas of the originator of the system it would be an advanced step in modern railroading. Mr. Hines abolishes the different titles formerly attached to the officers of the mechanical department, such as master mechanic, traveling engineer, resident engineer, etc., and clothes them with the title of assistant superintendent, thereby increasing their responsibility as officers of a railroad so that when they are traveling over the line they have the authority to correct any discrepancy or dereliction of duty on the part of station agents, train crews, maintenance of way employees, etc., which is a long stride in the right direction.

I do not wish to cast a reflection on transportation employees; unfortunately a few are inclined to be derelict if it is known that no one in authority is around to check their movements without fear of retaliation. For instance, the conductor may know the station agent or other employees are lax in their duties, causing inconvenience and delay. He may catechise or threaten to report the derelict, but through fear of retaliation, such report does not reach the proper officer. The conductor may be ever so attentive to his duties, not giving the slightest opening for retaliation, but his reputation as a fellow employee is at stake. Hence the authority of the master mechanic over the transportation employees while out on the line is of intrinsic value to the company.

The originator says his system opens a vast field of opportunity to the mechanical man making it possible for him to aspire to the most exalted position within the gift of a railroad. He is given the title and authority of an assistant superintendent, which is similar to putting a gyroscope engine in operation on a mono-rail. If his construction is correct he will be able to maintain his equilibrium if his gyrations are not interfered with. He is in charge of the mechanical department and responsible for its proper and economical maintenance. He is instructed by the superintendent of motive power (assistant general manager) strengthened by a copy of a letter from the president and general manager to the superintendent of motive power, to devote most of his time at the shops. He is expected to visit the several roundhouses on his division at least two or three times each month and regulate all mechanical matters. He is called to headquarters several times each month to confer on mechanical matters. His shop office is moved to the superintendent's office, which may be some distance from the shop, where all matters are handled and file records kept in conjunction with the superintendent's file, thus maintaining one file. He is expected to visit this office at least once each day and handle all correspondence requiring his attention.

All these duties he can perform if he is qualified for the position he is filling. He will be able to give valuable service to the company other than his regular duties as master mechanic while out on the line or in the superintendent's office by way of advice and instructions to subordinates, and if he is a reasonably close observer he will learn many things pertaining to the duties

of assistant superintendent and become enlightened along such lines to the extent of fitting himself for promotion in case of a vacancy. His technical knowledge as a mechanic would be valuable to him as a superintendent, at least such is my understanding of the intentions of the originator of the unit system, and if the master mechanic is lucky enough to be on good terms with and shows a willingness to be subordinate to the superintendent there is no good reason for his failure. If conditions are otherwise and the orders he receives from the superintendent of motive power conflict with those received from the superintendent, making it impossible for him to obey all orders, some one must expect to go on the shelf, although conditions may be unavoidable by one of the three parties. As a rule the "under dog" is the victim.

The unit system provides that there must not be any correspondence between the general officers and the subordinate officers of the superintendent. All correspondence emanating from the general office must be addressed to the division superintendent, he in turn sending such correspondence to the assistant whom it interests, who will reply permitting the senior assistant to sign it "for and in the absence of the superintendent," thereby precluding all possibilities of the issuance of conflicting orders. This rule is infallible if lived up to. However, we must not lose sight of the fact that there are a great many verbal conferences between the assistant superintendent (mechanical) and the superintendent, also with the superintendent of motive power when the assistant is called to headquarters to confer (presumably) on mechanical affairs. If the division superintendent and the superintendent of motive power are inclined to be congenial all will go well and the unit system will be carried out successfully harmoniously and economically. OBSERVATION.

CAR WHEEL FAILURES.

CHICAGO, April 21, 1913.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Our purpose is to set forth facts with reference to an article published in the *Iron Age* under date of March 6, page 588, under the caption, "An Increase in Number of Car Wheel Failures." The article referred to is based upon accident bulletins of the Interstate Commerce Commission, and after summarizing the derailments due to broken flanges and burst wheels states:

> The necessity of bringing the quality of the chilled iron car wheel to a proper basis is emphasized today as it has never been, and the makers and users should get together and try and find means of improving the quality of car wheels to make them equal to present service conditions.

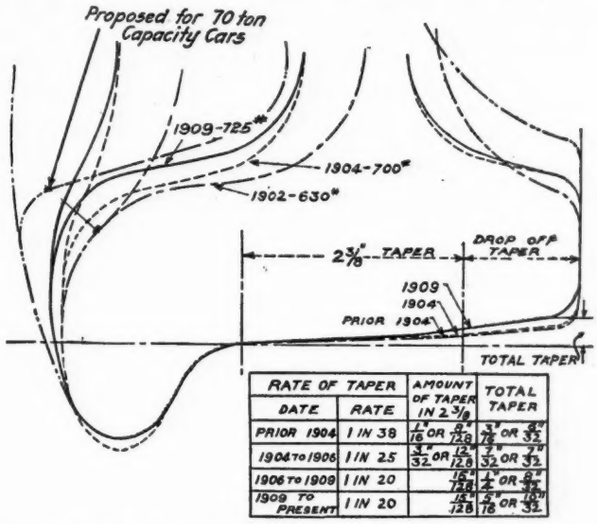
Apparently the writer does not know that the Association of Manufacturers of Chilled Iron Car Wheels, representing 95 per cent. of the wheels manufactured in the United States, and the Master Car Builders' standing committee on car wheels have been closely associated since the year 1909 for the express purpose of improving the quality of the chilled iron wheel.

Previous to the year 1909, individual wheel makers had made improvement in their patterns and product, but no concerted action had been taken until the year 1909, when standard wheels for the three classes of cars of 30, 40 and 50-tons capacity were submitted by the manufacturers and approved by the Master Car Builders' Association. Before these three standards were adopted there were as many different patterns as there were manufacturers, and many railroads had standard patterns of their own. The standards recommended were not in general use until the year 1911, because the Master Car Builders' Association gave the manufacturers a sufficient time to adjust their equipment to the new standards.

In analyzing the derailments caused by broken flanges and burst wheels for the purpose of determining what progress has been made in the quality of the the chilled iron wheel, we must consider the dates that the wheels were cast, and not charge all the failures during the year 1912 against the product of that year. This is the only proper basis upon which to proceed.

In determining the percentages of derailments of cars due to broken flanges and broken wheels, the number of failures in any one period cannot be consistently compared with another unless the number of wheels in service is considered, and it is manifestly unfair to state that during the period of 1902-3-4 there were 1,070 derailments, and during the period of 1910-11-12 there were 1,827, and figure an increase of 70 per cent., as was done by the above mentioned writer. In 1902 there were 1,500,000 freight cars in service, representing 12,000,000 wheels; in 1910 there were 2,133,000 freight cars in service, representing 17,068,248 wheels—an increase of 40 per cent. in the number of wheels in service; and this increase represents wheels serving under heavy capacity cars.

The Chilled Iron Car Wheel Manufacturers, in conjunction with the Master Car Builders' Association, have made greater progress in the chilled iron wheel industry since the year 1909 than has ever been made, and when consideration is given to the vast increases in car capacity, and the resultant increases in rail and axle during the last decade, and the slight increase in the weight of the wheel, it will be found that the chilled iron wheel has not only met every condition of service imposed for the past 52 years, but the record will show that the derailments due to broken flanges and burst wheels are actually decreasing. The



RATE OF TAPER		AMOUNT OF TAPER IN 2 3/8	TOTAL TAPER
DATE	RATE		
PRIOR 1904	1 IN 38	1/16 OR 8/128	3/32 OR 12/128
1904 TO 1906	1 IN 25	3/32 OR 12/128	7/32 OR 28/128
1906 TO 1909	1 IN 20	16/128	1/4 OR 32/128
1909 TO PRESENT	1 IN 20	16/128	5/16 OR 40/128

Changes Made in Flange and Tread Sections of Car Wheels Since 1904.

following table shows the changes that have been made in developing the 10-ton car to the 50-ton car:

Weight, increase in car capacity	400 per cent.
Weight, increase in rail	100 per cent.
Weight, increase in axle	149 per cent.
Weight, increase in chilled iron wheel	38 per cent.

One part of the chilled iron wheel that has not received due consideration is the flange. In an editorial in *Harper's Weekly* (industrial series), December 28, 1912, appears the following: "It is a curious fact that in this matter of flanges the cars of today are no better off than were the cars that carried soldiers and supplies to the battlefields of the Civil War."

This condition is not because the wheel makers have not been fully alive to the situation, but because they have been restricted in improvements due to the supposed limits of track clearance. The accompanying illustration will show such improvements in the flange as have been made since 1904. This indicates a slight increase of metal in the back of the flange in 1904, as the weight of the wheel increased from 630 lbs. to 700 lbs. It will also show that during 1909 a further increase was made, starting at a point slightly below the base line and extending around the flange and back of the tread, producing an increase in tread thickness and increasing the weight to 725 lbs. These slight changes, together with a reduction in the height from 1⅛ in. to 1 in., are the only improvements made in the flange, and it must be remembered that the capacity of the cars has increased from 10 tons to 50 tons. This was all we could get, but not as much of an increase as we wished to make in order to increase the factor of safety.

We are still trying to improve the flange, but cannot go further until such a time as the railroads will approve of a design similar to that shown in the illustration for a flange for 140,000 lbs. capacity cars. When this is done flange failures will be reduced to a minimum.

The flange of the wheel exercises the important function of guiding the trucks and, in going around curves, it is the flange that takes up the lateral thrusts of the car by being forced against the rail, and the contact between wheel and rail produces wear in both. A flange, therefore, does not improve in strength with age, and the longer it is used the more the wear, and the thinner and weaker it becomes. The imperative necessity of careful inspection follows, so that a wheel may not be allowed to wear in the flange beyond the condemning limit.

Many times in looking for the cause of a derailment a wheel will be found with a broken or chipped flange, and this cause is readily assigned, whereas, as a matter of fact, the flange may have been chipped or broken after it left the track, or through poor track, faulty truck construction, etc. We know of cases where a broken flange was reported as the cause of a derailment, and upon investigation we have found that the flange had been worn beyond the condemning limit. Many derailments are reported to the Interstate Commerce Commission caused by sharp flanges climbing the rail in going around curves, or passing crossings, frogs, or switches.

Let us examine the record of broken flanges for the year 1912, as compiled from the Interstate Commerce reports:

Year Cast.	Broken Flanges.	Year Cast.	Broken Flanges.
1898	2	1908	12
1899	9	1909	13
1900	4	1910	16
1901	7	1911	2
1902	12	1912	2
1903	10		
1904	8		170
1905	16	No record of year cast	457
1906	23		
1907	34	Total reported	627

As will be seen, we have a record of 170 wheels out of a total of 627 reported broken, or 27 per cent. The service is from one to twenty-four years, and the average life of all the 170 wheels is over six years.

As a flange is at its best when first put into service, it will be interesting to note the comparatively few failures for wheels cast during the years 1910-11-12. The total breakages of flanges in the three years amounted to 20 wheels. The report shows that during the year 1910 there were 16 breakages, only two in 1911 and two in 1912. As we only have a record of 27 per cent. of the broken flanges during this period, and as this record shows 16 wheels were cast in 1910, it would be reasonably fair to assume that the balance of the wheels (if tabulation could be made) would bear relatively the same proportion of breakages—therefore, we can assume that if we had a complete record, there would have been broken approximately 60 wheels cast in 1910. During the year 1910 there were in service over 2,000,000 freight cars, and there were running over 16,000,000 chilled iron wheels. This would represent one wheel broken for every 266,000 wheels in service. If we take the total breakages, which are reported as 627, and consider the number of wheels running, we will find that there is one breakage for every 25,000 wheels in service and the broken flange wheels which we have tabulated from the Interstate Commerce Commission reports show an average of six-and-a-half years' service. Surely this is not an alarming condition when we take into consideration that a very large percentage of those broken were of the old design and plainly show abuse due to sticking brakes and excessive wear.

Broken wheels are the result of temperature stresses arising from brake friction, and show conclusively that the metal has not been proportioned to the stress. In designing any structure, a unit of material is used to resist a unit of stress, and when all service conditions are known it is a simple matter to proportion the metal to fully meet them. If wheels were designed to meet the most severe service conditions instead of average conditions, there would be no broken wheels.

We will now analyze the report of broken wheels. Our record, as compiled from the Interstate Commerce Commission report, shows the detail of 109 broken wheels as to years cast, name of maker, etc. There were 229 breakages for which we could obtain no record. An analysis of the 109 wheels reported is shown in the following:

Year Cast.	Broken Wheels.	Year Cast.	Broken Wheels.
1889	1	1908	5
1892	1	1909	9
1897	1	1910	14
1899	1	1911	10
1900	5	1912	7
1901	3		
1902	8		109
1903	9	Broken and loose tires on engine drivers	19
1904	4	No record of year cast	229
1905	6		
1906	12	Total	357
1907	13		

It will be observed that the broken wheels, like the broken flanges, are distributed over a period of years, starting with the year 1889, and the average service of all wheels broken is over six years. The cause assigned for the breakage of 52 wheels out of the 109 reported by the Interstate Commerce Commission is "brakes sticking."

Fifty per cent. of the broken wheels were caused by "brakes sticking," and 90 per cent. of the broken wheels occurred in the mountainous regions of the East and West, where the maximum of brake resistance is required in descending grades. A large number of these wheels plainly show improper usage. For example:

A 625 lb. wheel designed for a car having a light weight of 28,000 lbs., as required in the M. C. B. standards, would be called upon to resist a normal heat stress resulting from 19,600 lbs. brake pressure when the train is braked at 70 per cent. of the light weight of the car.

A 625 lb. wheel for a car having a light weight of 50,000 lbs. braked at 80 per cent. would have to resist an abnormal stress of 40,000 lbs. brake pressure, or 150 per cent. greater stress demanded from the same weight of wheel.

It is no common thing to find 625 lb. wheels under cars weighing from 45,000 lbs. to 50,000 lbs.; in fact, many 60,000 lbs. capacity cars weigh light more than 100,000 lbs. capacity cars. Still, the wheels designed for 100,000 lbs. capacity cars weigh 100 lbs. more than those designed for 60,000 lbs. capacity cars, this additional metal being distributed in the plates of the wheel, which increases the strength and furnishes greater resistance to sticking brakes. The heat developed by excessive brake application is what causes wheels to break.

The Master Car Builders' in their 1912 Proceedings recognized the question of establishing the maximum braking power as well as gross load for each design of wheel, and called particular attention to the trouble experienced in using 625 lb. wheels under 60,000 lbs. capacity cars, having tare weight of 40,000 lbs. to 47,000 lbs., such as refrigerator cars, etc.; if their recommendations are followed broken wheels will be practically eliminated.

If we take the entire number of chilled iron wheels broken during the year 1912 and base these breakages upon the number of wheels in service, we will find there is, comparatively, one broken wheel for every 50,000 wheels in service.

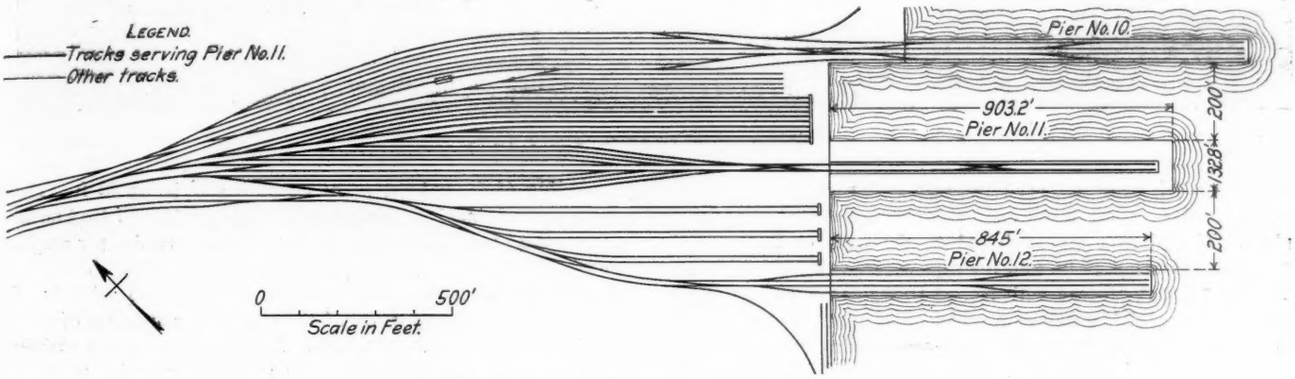
The commerce of the country is dependent upon the chilled iron car wheel. It has successfully resisted the attacks of over half a century. It is the standard wheel for rail-borne traffic, and its universal use is an acknowledgment of its efficiency. It possesses the ideal structural advantages of hard tread, soft plates and soft hub, and each part of the wheel is so well fitted for the service demanded that it is no wonder that it has survived such a long period of use. It carries the car structure and contents all over the country, and because an occasional wheel breaks it does not follow that the wheel is to blame, because anything can be broken by abuse, and no one will deny that the chilled iron wheel has a tremendous burden to bear. The chilled iron wheel now carries over 500,000,000,000 tons one mile each year.

GEORGE W. LYNDON.

NEW FREIGHT PIER AT COMMUNIPAW, N. J.

A Modern Fireproof Structure of Concrete and Steel Construction for the Reception and Storage of Export Business.

The Central Railroad of New Jersey completed early last year a new covered freight pier of permanent construction to be known as pier No. 11 in its freight terminals at Communipaw, N. J., on the west side of the Hudson river opposite New York and just across the channel from Ellis Island. The new pier adjoins pier No. 10 and is reached on the water side by two 200 ft. slips with a depth of 22 ft. at mean low water, and on the land side by a double track line from a storage yard adjacent to the piers. The tracks leading out onto the pier are laid in a track well along the center of the pier, which is depressed so that the car floors are level with the deck of the pier. The new pier is 902 ft. 2 in. long by 132 ft. 10 in. wide. The substructure consists of creosoted pile bents which support a concrete deck slab floor. The superstructure is of steel frame with corrugated iron siding.



Track Layout at New Communipaw Pier.

As the piers are perpendicular to the tracks in the main yard, it is necessary for economical operation to locate small storage yards near each pier to store the cars intended for that pier. It is somewhat difficult to get a good track layout on account of this condition. The new yard serving pier No. 11 has been laid on a fill made from the dredgings from the channel and slips. The yard includes 10 tracks, each about 950 ft. long connecting with two ladders, five tracks leading from each ladder. These ladders are continued to form a double track lead into the pier. Double crossovers are provided between these two lead tracks just off the end of the pier and at a point about midway on the pier. These crossovers allow very free movement of cars to or from the pier without disturbing other cars that may be unloading. Loaded cars come into one of the five track yards and the empties are pulled off of the pier into the other set of five tracks. In addition to the tracks mentioned, there are 10 stub tracks provided for storage.

The pile bents in the substructure of the pier are placed 9 ft. center to center. The intermediate bents consist of 30 piles each and alternate bents located under the columns of the superstructure have 38 piles. Every tenth bent has a double row of piles containing 60 in all. Each alternate one of these double bents has the piles cut off 6 in. above mean low water and capped with two 12 in. by 12 in. timbers to carry a reinforced concrete fire wall 18 in. thick at the bottom and battered to 12 in. thick at the top extending up to the concrete floor slab to which it is bonded. These fire walls divide the wooden substructure into five sections. The remaining double bents which alternate with those carrying the fire walls have 6 in. by 12 in. sheathing between the rows of piling extending from the low water line up to the deck. As piles can only be driven a short distance at the site of the pier, the bents are thoroughly braced both transversely and longitudinally.

The corners of the piers at the sea end are protected by cluster piles cut off 9 ft. above mean tide or 1½ ft. above pier level. Two anchor cribs are provided, one at the sea end and one near the middle of the pier. These cribs cover four bents and are the full width of the pier. They were built in place after the piles within their area had been driven and were sunk by being loaded with stone. The bulkhead wall at the shore end is of concrete carried on a timber bulkhead. The bearing piles are of creosoted yellow pine 14 in. in diameter, 2 ft. from the butt and 7 in. in diameter at the point. The cluster piles are of untreated white oak 16 in. and 7 in. in diameter. All other timber in the sub-

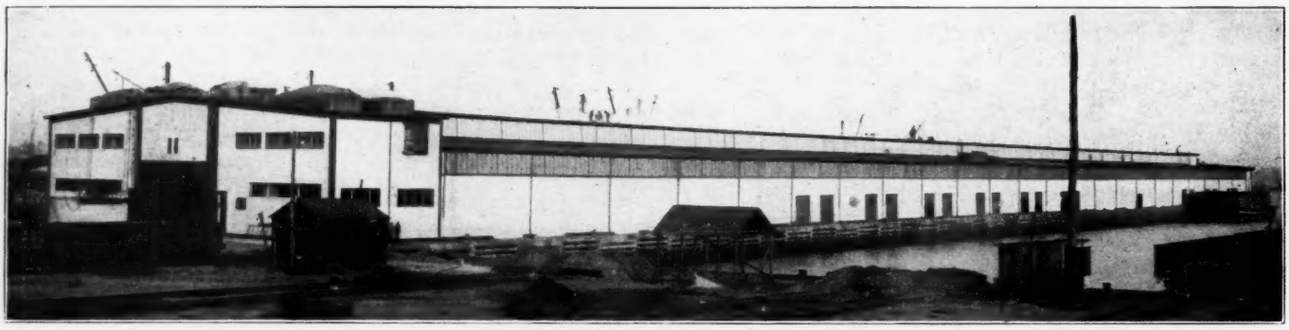
Sea End of New Pier.

structure except the low water bracing, longitudinal and diagonal bracing and fender timbers is creosoted.

The entire deck covered by the shed is of concrete. The space outside of the shed, which is 4 ft. wide on the sides and 8 ft. wide on the sea end, is of 4 in. planks. The track well is 24 ft. wide and is depressed 5 ft. The tracks are laid on 12 ft. centers. The platforms on each side of the track well are 50 ft. wide, being sloped 6 in. away from the track well. The floor slab is 7 in. thick and is supported on eight longitudinal concrete girders on each side of the track well. These girders are 1 ft. 6 in. deep and vary in width from 9 in. to 14 in. They are laid directly on the caps of the pile bents and are reinforced with rods, some of which are trussed over the bents and others continuous in the lower plane. The girders are anchored to the caps by 22 in. dock spikes driven about 10 in. into the caps before casting the girders. The slabs are reinforced with No. 38 triangular mesh bent up to the top of the slab over the girders. The slab on each side of the track well is divided longitudinally by a continuous expansion joint over one of the girders. The reinforcement in that girder is divided so that the joint is continuous through the slab and the girder. Transverse expansion joints are spaced 54 ft. apart and are of similar construction.

The slab in the track well has a minimum thickness of 16 in., being crowned in each panel for drainage. A minimum thickness of 6 in. of ballast is used under the track ties. A vertical slab 5 in. thick is placed along the sides of the track well, having steel fire doors at intervals to allow access to the timber substructure. The floor slab is designed for a live load of 500 lbs. per sq. ft. and the track slab for a live load of 1,300 lbs. per sq. ft. The concrete in the slabs is a 1 : 2½ : 5 mixture with a surface coat of cement and trap rock screenings in a 1 : 2½ proportion.

The columns and trusses of the superstructure are spaced 18 ft. center to center, all sections being built up of plates and angles. There are four rows of columns, the central span between columns being 44 ft. and the spans on each side being 40 ft. The trusses and columns are designed for an assumed roof loading as follows: dead load, 22 lbs. per sq. ft.; live load, 50 lbs. per sq. ft., and wind load, 30 lbs. per sq. ft. of horizontal surface. The steel frame is covered with galvanized corrugated iron to a height of 17 ft. 5 in., the upper portion of the side wall consisting of continuous steel sash 5 ft. 10 in. high. A similar continuous sash in the monitor deck is provided with an operating device to allow for ventilation of the building. The roof is carried on channel purlins and is covered with 5 ply felt, tar and slag laid on a 1 : 12 pitch. Ventilators 2 ft. in diameter are located along the monitor deck at intervals of 18 ft. The doors on the sides and the sea end

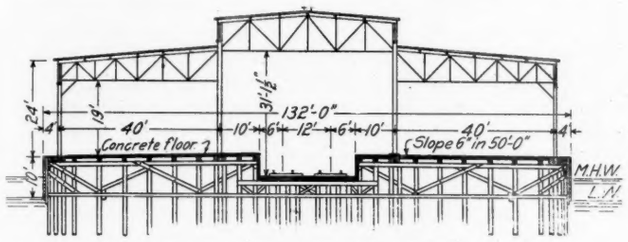


Exterior of Pier from Shore End.

Interior of Pier Showing Track Well, Platforms and Steel Superstructure.

are 12 ft. 5 in. wide and 11 ft. 5 in. high, the two doors on the shore end being each 14 ft. wide by 22 ft. high. All doors are of steel frame construction with corrugated iron covering and are arranged to slide vertically, being counterweighted to make their operation easy. The doors on the side are arranged in pairs 18 ft. center to center, the pairs being spaced 54 ft. center to center. There are three ladders on each side of the building, allowing access to the roof. Copper downspouts at intervals of 36 ft. are provided to carry off the drainage.

The inside walls in the freight room between doors are protected by 2 in. by 8 in. spruce guard planks 10 in. center to center. At the shore end of the pier a supply and store room, boiler room, coal room, toilet and locker rooms are provided and two scale pits 4 ft. by 6 ft. in area are located at convenient points on the pier. The offices are located on a second floor in the first three panels of the superstructure at the shore end. The floor of this second story is laid on trusses supported from the columns, the



Typical Cross Section of Pier.

floor level being 19 ft. 9 in. above the pier level. A concrete slab is laid on these trusses which is covered by yellow pine flooring in the offices. The ceiling of the offices is hung by rods from the roof purlins. The space on this second floor is divided into a general office, record room, foreman's office, corridor and toilet. It is reached by two stairways and is lighted by skylights and side windows. A speaking tube and two bill elevators connect the general office with the main floor.

This pier was built under the direction of J. O. Osgood, chief engineer, Central Railroad of New Jersey, and A. E. Owen, principal assistant engineer, to whom we are indebted for the above information. The contract was let in three parts; the timber substructure being built by George Spearin, New York; the concrete deck by Henry Steers, Inc., New York, and the steel superstructure by the Hay Foundry & Iron Works, New York.

New Line for Peru.—The government of Peru has now accepted the proposal to extend the railway at present operating between Tambo de Mora and Chincha to the districts of Castrovirreyna and Huancavelica, a concession having been granted to the Tambo de Mora Railway Company, a locally-owned enterprise, to construct the line which it is allowed to operate for a period of 90 years, after which the whole concern falls into the possession of the government without the payment of any indemnity to the company.

MALLETS ON THE NORFOLK & WESTERN.

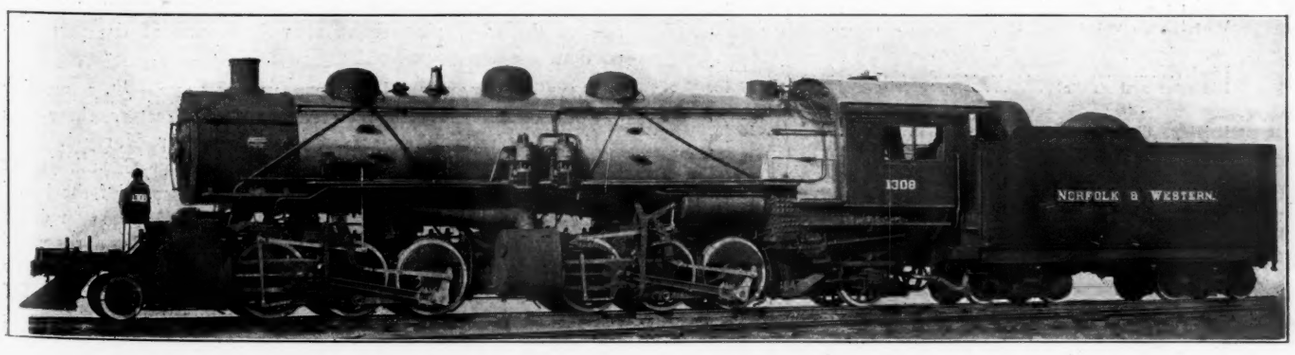
For the year ending June 30, 1912, the average revenue tons lading per freight train mile on the Norfolk & Western was 692.43, an increase of 7.75 per cent. over the preceding year. In connection with the development of heavier train units on that road ten Mallet locomotives were introduced in May, 1910; five of these were of the 0-8-8-0 type, and five were of the 2-8-8-2 type. In 1912 forty Mallets of the 2-6-6-2 type, built by the American Locomotive Company, were introduced and forty more are now in process of building. The addition of the trucks was made in order that the boiler capacity might be made larger, thus increasing the sustained capacity of the locomotives, which is necessary where they are used in road service, as the case on the Norfolk & Western.

In ordering this equipment, it was the purpose of the Norfolk & Western officials, not so much to dispense with the pusher service, as to increase the maximum train load over the division. On the Pocahontas division, between Eckman, W. Va., and Bluefield, five 0-8-8-0 type, five 2-8-8-2 type, and fifteen of the new 2-6-6-2 type Mallets are being operated in both head end and pusher service.

On the Radford division, between Bluefield and Roanoke, Va., five of the new 2-6-6-2 type Mallets are being operated in road service. This division is 105 miles long and includes a forty-mile grade of 0.4 per cent. and a ten-mile grade of 1.0 per cent. With the help of a pusher service on this ten-mile 1.0 per cent. grade the Mallets have increased the train tonnage from 2,800 to 4,000 tons.

The remaining twenty of the new 2-6-6-2 type Mallets are being operated in road service on the west end of the Norfolk division, between Roanoke, Va., and Crewe, a distance of 130 miles. Because of especially favorable terminal as well as road facilities, these Mallets are doing their best work on this division. Before the installation of the Mallets the tonnage on the division was handled by 4-8-0 type locomotives, having a total weight of 260,000 lbs., 220,000 lbs. being on drivers, and having a tractive effort of 52,500 lbs. Leaving Roanoke with a 3,500-ton train, which was the rating, two of these 4-8-0 type engines were at the head end. At Bonsack, Va., a 4-8-0 type locomotive was put behind the train to push it to Blue Ridge. At Blue Ridge, Va., the helper was cut out and returned light to Bonsack to await another eastbound train. From Blue Ridge the 3,500-ton train, with the two engines in the lead, proceeded to Phoebe, Va. At Phoebe the lead engine was cut out and the train and the one engine continued to Crewe. The one 4-8-0 type engine readily hauled the 3,500-ton train over this portion of the road, except that at Farmville, Va., it was assisted over the short grade by another 4-8-0 type engine.

At present, starting out from Roanoke with a 5,000-ton train, one of these Mallets is in the lead, double-headed by a 4-8-0 type locomotive. These two engines pull the train from Roanoke to Bonsack, a distance of 9 miles, made up of broken grades. At Bonsack another of the Mallets is put behind the train and pushes it to Blue Ridge, a distance of 6 miles. From Bonsack



Mallet Locomotive of the 2-6-6-2 Type as Used on the Norfolk & Western.

to Blue Ridge there is a ruling grade of 1.2 per cent. At Blue Ridge the pusher cuts out and returns to Bonsack light. From Blue Ridge the two engines in the lead haul the train to Phoebe, a distance of 56 miles from Blue Ridge. This 56 miles is made up of broken grades, but includes a 0.5 per cent. grade 8 miles long. At Phoebe the leading 4-8-0 type engine is cut off and waits for a westbound empty train, helping as a double-header back to Roanoke. From Phoebe, therefore, the one Mallet or through engine hauls the train to Crewe, a distance of 59 miles of broken grade, with the exception of the 16 miles from Farmville to Burkeville. This 16 miles is made up of a continuous grade of 0.45 per cent. and a 4-8-0 type engine is used as a pusher. This means that on the Radford division train loads have been increased 79 per cent., and on the Roanoke division 43 per cent. Fifty-seven locomotives have been supplanted by these forty Mallets, and a reduction of 25 per cent. has been effected in the number of freight trains operated over the divisions.

The boiler of the 2-6-6-2 type locomotive incorporates a combustion chamber 78 in. long. This allows the firebox to be brought back of the rear driving wheels, thereby making it possible to obtain a good depth of throat sheet, without excessively increasing the length of tubes. As a result a throat sheet 18 1/16 in. deep is obtained with a tube length of 24 ft. High temperature superheaters and brick arches are used. Fifteen engines are equipped with Walschaert and twenty-five with Baker valve gear. All the engines have Street stokers. Reversing is effected by means of the builders' hydro-pneumatic reversing gear, which not only renders the operation of the engine easier than that of the ordinary simple engine, but allows the use of steam with a full throttle and the cut-off arranged at the most economical point. The builders' latest style of outside bearing trailing truck is used. This was also used on the Chesapeake & Ohio Mallets, and is similar in design to that successfully applied to a number of recent Pacific type locomotives. With the exception of the case above mentioned, the type of leading and trailing trucks applied to Mallet locomotives by the American Locomotive Company has been the radial swinging bolster type with journals inside of the wheels. The outside bearing truck used gives a wider supporting base and tends to add to the stability of the locomotive.

The American Locomotive Company's system of compounding, including intercepting valve, was also applied. With this system it is possible to increase the power of the engine about 20 per cent. at critical moments, by admitting live steam to all cylinders. At the same time, the intercepting valve so controls the pressure of the live steam entering the receiver pipe that equal work is done in all four cylinders.

Following are the principal dimensions, weights and ratios of the new 2-6-6-2 type locomotives:

General Data.

Type	2-6-6-2
Service	Freight
Fuel	Soft coal
Tractive effort working compound	72,800 lbs.
Weight on drivers	337,300 lbs.
Weight, total engine	405,000 lbs.
Weight, total engine and tender	563,000 lbs.
Wheel base, driving	10 ft. 0 in.
Wheel base, rigid	10 ft. 0 in.
Wheel base, engine	48 ft. 10 in.
Wheel base, engine and tender	79 ft. 3½ in.

Cylinders.

Kind	Compound
Diameter and stroke	22 in. and 35 in. x 32 in.

Wheels.

Driving, diameter	56 in.
Driving journals	10 in. x 12 in.
Truck, diameter, front	30 in.
Truck journals	6 in. x 10 in.
Truck, diameter, back	44 in.
Truck journals	8 in. x 14 in.

Boiler.

Type	Conical connected
Working pressure	200 lbs.
Diameter, front	83⅞ in.
Diameter, back	96 in.
Firebox, length and width	108⅛ in. x 96⅛ in.
Tubes, number and diameter	243—2¼ in., and 36—5½ in.
Tubes, length	24 ft. 0 in.
Combustion chamber	78 in.
Heating surface, tubes	4,655 sq. ft.
Heating surface, firebox	343 sq. ft.
Heating surface, arch tubes	25.4 sq. ft.
Heating surface, total	5,023.4 sq. ft.
Superheating surface	995 sq. ft.
Grate area	72.2 sq.ft.

Tender.

Wheels, diameter	33 in.
Journals, diameter and length	5½ in. x 10 in.
Water capacity	9,000 gals.
Coal capacity	14 tons

PROPOSED INCREASE IN FREIGHT RATES.

The committee of the railways in Official Classification territory, Messrs. Willard, Rea and Brown, has announced that the application of the roads to the Interstate Commerce Commission for authority to increase freight rates will be made in the shape of a petition for the re-opening of case No. 3400, which was heard and passed on by the commission in 1910. The proposition, in 1910, was to increase the so-called class rates and a few of the commodity rates. It proved impossible to accomplish anything on this basis and the present proposition is for a small advance on all rates. Numerous complaints which have been made during the past two years have shown that the relation of rates between localities is of greater importance to the public than the actual rate per se. The officers of the railways believe that with the increase in expenses which has taken place within the past few years, the margin of profit is now so small that an increase of 10 per cent. in all freight rates would be justified; but it is desired to cause the least possible disturbance of commercial conditions, and therefore only 5 per cent. will be asked for at this time. Some commodity rates are very low, and it has been urged that these ought to be raised; however, this cannot be done without the co-operation of the shippers with the railroads and with the assistance of the commission.

"Since the previous hearing (1910) the railroads generally have expended large sums for equipment and additional facilities, and while there has been some response in the way of increased gross revenues, the surplus income after paying charges and dividends, has been so narrowed as to not encourage the further expenditures required to keep the railroads abreast with the growing demand of the business of the country. Unless the carriers are enabled to increase their revenue in some manner—and the plan above proposed seems likely to meet with less opposition than any other—their ability, already limited, to provide such additional equipment and facilities as will be necessary to take care of the growing demands of the country will be very seriously impaired."

Self-appointed spokesmen for shippers have already given notice in New York, Philadelphia, Chicago and other cities, that the application of the railways will be opposed.

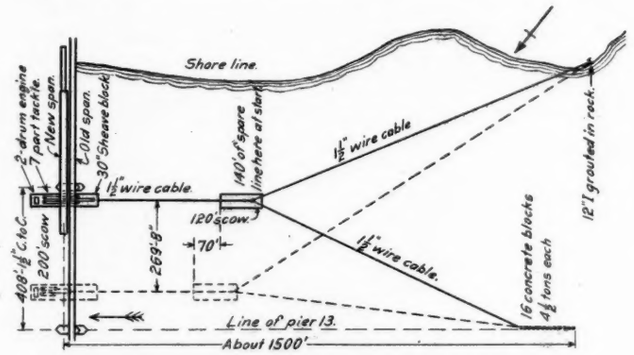
AMAZON-PACIFIC RAILWAY.—The Amazon-Pacific Railway, Peru, which is expected to do so much towards improving the foreign as well as the interior trade of the republic of Peru, is about to actively start upon its construction. Work will be commenced upon the Goyllarisqisga section, which is one of the most picturesque as well as one of the most important.

BRAVE RAILWAYMEN REWARDED IN ENGLAND.—At a meeting of the London & North Western board of directors, three men —Hugh Roberts, dock-gateman at Garston; Harry Holley, signalman at Ringstead; and Thomas George Cowell, junior porter at Northampton Castle, received the thanks of the board and checks for conspicuous acts of bravery. At Garston docks Roberts, who could not swim, let himself down by a rope and rescued a woman who had fallen into the water between a ship and a quay. Signalman Holley rescued a man who fell into Ringstead locks, and who died after being brought out; and Porter Cowell jumped into the Nene river while it was in flood and rescued a man who had fallen in.

ERECTING THE ST. LAWRENCE RIVER BRIDGE.

Conditions Made It Advisable to Use a Very Small Amount of Falsework in the Erection of the Superstructure.

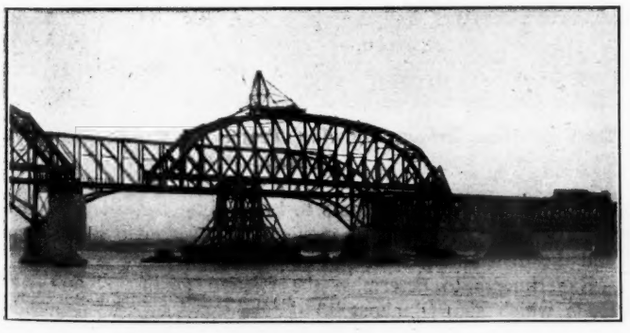
The Canadian Pacific bridge over the St. Lawrence river in the suburbs of Montreal, which was built as a single track structure including eight 240 ft. deck truss spans, two 270 ft. flanking and two 408 ft. channel spans, has just been replaced by two lines of single track spans supported on the original piers and on four intermediate piers which were built in the four northerly spans. The reconstruction of the piers and the general plan of erection of the superstructure were described in the *Railway Age Gazette* of October 11, 1912. At the bridge site, the river bottom is very rocky; and the water is from 5 to 40 ft. deep, with a current of about 8 miles an hour, making it advisable to



Anchorage of Scows for Launching Channel Spans.

erect the new superstructure with the use of a very small amount of falsework. The detailed erection methods are included in the present article.

The eight new 120 ft. spans which replace the four 240 ft. spans on the northern or Montreal end, were erected successively from the shore on 115 ft. falsework spans consisting of steel trusses 10 ft. deep, weighing about 10,000 lbs. each. These trusses were handled by two traveling cranes moving on the old superstructure and working only between regular trains. From four to five days were required for the erection of each new 120 ft. span. After they were erected, permanent track was laid on them and



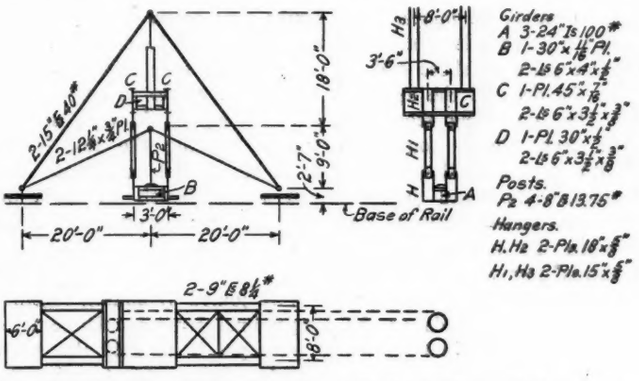
Launching Second Channel Span.

the traveling cranes first removed the down stream falsework truss in each span, after which the up stream trusses were pushed transversely under the structure to the position formerly occupied by the other trusses and were in turn removed by the cranes.

After the erection of the eighth 120 ft. span, traffic was shifted over the new superstructure, thus releasing the northerly four 240 ft. spans which were removed by traveling cranes moving on them; the steel being carefully disconnected so as to make it available for re-erection elsewhere.

The four 240 ft. spans on the down stream side between piers 7 and 11 were erected on 120 ft. falsework trusses supported on falsework towers. These trusses were erected in the northerly half of each span. The bottom chords of the new spans were assembled on them in position and riveted up complete, the section of chord which spanned between the end of the falsework and the next pier in advance having strength enough to be self-supporting for the clear distance of about 120 ft. The center panels of the new trusses were erected on the bottom chords over the center falsework tower, then one adjacent panel was erected on the bottom chords beyond the falsework tower, after which the northerly end of the span was erected over the falsework trusses and finally the erection of the span was completed from the center to the forward pier and the falsework trusses and towers removed. The maximum depth of water in which these falsework towers were built was about 18 ft. The falsework trusses for each span were erected in about one-half day and the erection of one 240 ft. span was completed by 30 men in 11 days. The field riveting was done by an additional force of 10 four-man gangs, using pneumatic hammers.

The two 270 ft. flanking spans on the down stream side of piers 11-12 and 14-15 were erected on two spans of the 120 ft. falsework trusses. These trusses were supported near the piers



Distributing Truss for Shore End of Channel Span.

on transverse trestle bents and at the center of the span on falsework towers resting on the rock bottom.

As the water under the two 408 ft. channel spans was about 40 ft. deep and it was necessary to keep the stream open for navigation, these spans could not be erected on falsework. As the location is an extremely windy one, and it was impossible to tie to the old structure in the erection of the new, due to the fact that the old spans were loaded to their allowable maximum by the traffic passing over them, erection by the cantilever method seemed inadvisable. It was therefore decided to erect each 408 ft. span on the adjacent 270 ft. flanking span with three of its nine panels overhanging the river and to launch them endwise into place.

These spans were erected by a top chord traveler moving on a track laid on the upper chords of the large trusses. When moving, it was supported on wheels and when lifting steel it was blocked up at the forward end just ahead of the wheels. The traveler was of the derrick type with a 50 ft. and a 20 ft. boom, the latter being hung in the center of a swinging "A" frame held in place by stiff back ties connected to the base of the frame by pins which could be shifted so as to keep the "A" frame vertical as the traveler moved over the curved top chord.

When a span was completely erected it was raised off the blocking and the forward end carried on a special scow on which

was built a wooden tower. A distributing truss resting on three pairs of shoes supported the rear end over the deck truss. The total weight of one of these spans, including the traveler, was 2,730,000 lbs. The load on the scow was 1,855,000 lbs., and that on the trusses 885,000 lbs. As this load on the approach truss had to be carried by the floor system, it was necessary to distribute it over about 40 ft. of length to prevent the overloading of the stringers and floor beams. It was also necessary to support the rear end of the truss in such a manner as to allow the outer end, carried on the scow, to move slightly in a vertical and considerably in a horizontal direction. This was accomplished by the use of a disk bearing placed on the center line of the bridge, which was suspended from the top of two pairs of inclined struts hinged to sliding shoes at their lower ends. These struts were kept from spreading by tie bars attached to the lower ends of the struts and set at such an angle that the vertical component of their stresses equaled one-third of the vertical component of the stresses in the inclined struts. These tie bars were connected at their intersection to a vertical strut also hinged to a shoe. By this arrangement the total load was distributed over six shoes with a fairly equal proportion of the load on each one and considerable freedom was allowed the shoes to accommodate themselves to any unevenness of the track.

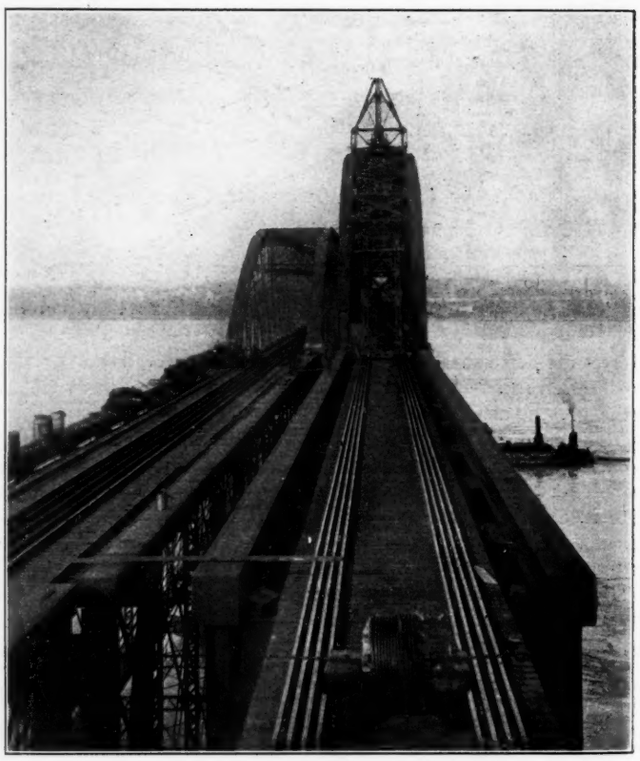
The inclined struts used in this distributing truss were composed of two 15 in. 40 lb. channels and the tie rods were made up of two 12¼ in. x ¾ in. plates. The bearing for the load was secured by a system of built up girders which were hung from the connection of the struts by hangers made up of 15 in. x ⅝ in. plates. The center post below the connection of the tie rods is made up of four 8 in., 13.75 lb. channels. The three pairs of shoes slid on two lines of four rails each, laid on the deck of the approach truss 8 ft. center to center.

The supporting scow was 200 ft. long, 37 ft. wide and 10 ft. deep, having four steel trusses running the full length with steel latticed cross frames at about 8 ft. intervals. The sides, bottom and deck were of 4 in., British Columbia fir. Heavy timber keelsons and deck stringers were placed between the longitudinal trusses. These scows were built in halves and were used for other purposes until required for launching the spans, when they were joined by bolting together the projecting ends of the longitudinal trusses. Three light wooden longitudinal bulkheads were put in to hold the water in case the scows should rock when being placed under the bridge or under water ballast. To distribute the load on the scow, four 100 ft. plate girders were used to support timber falsework with steel bracing reaching up to the under side of the trusses. Two centrifugal pumps, two valves for flooding the scows and a valve between the two halves of the scow to regulate the height of the bow and stern were provided. There was also a hoisting engine at the stern to handle the anchor lines.

The main scow supporting the truss was anchored by a 1½ in. cable to a second scow 120 ft. long located about 500 ft. up stream. This scow in turn was anchored by 1½ in. wire cables to special anchorages. The extreme width of the river made it impossible to locate these anchorages on the shores and two of them had to be provided in the river bed. These were composed of 16 concrete blocks weighing 4½ tons each threaded on a 1½ in. plow steel cable with heavy double 6 in. pipe 12 in. long between each to allow the blocks to conform to the uneven bottom. These anchors were placed about 1,500 ft. above the bridge and in line with the two outer piers supporting the main channel spans. After the laying of these anchorages, cables were taken to the opposite piers and heavy strains put on them to set the anchorages firmly in the bottom. A third anchorage was provided on the shore, consisting of 12 in. "I"-beams grouted into the rock at the edge of the water.

The cables connecting the upper scow to the anchorages were fastened to a special stubbing post on the scow. The length of the cable to the center anchorage remained fixed, the transverse movement of the scow being secured by paying out the cable to the side anchorage, and allowing the scow to revolve about the middle anchorage as a center. This caused a movement down stream of about 70 ft., which was taken up in the cable connecting the two scows so as to prevent the scow supporting the span from moving down stream. It was found that the anchor lines worked a little unevenly, the steel cable sticking on the stubbing post and paying out by jerks, but as ample provision had been made for movement of the outer end of the span, no harm was done.

The bridge was moved by a 65 ton Lidgerwood unloader located on the deck truss just back of the rear end of the long span in the position occupied during erection. Steam was furnished to this unloader by a locomotive adjacent to it. Power was applied to the long span through girders thrusting against the two center shoes under the distributing truss, the purchase of the hauling lines being carried around sheaves in these girders, to and around sheaves placed at the outer end of the 270 ft. span. The girders carrying these sheaves butted against the sliding track so as to keep the stresses developed by the frictional resistance to moving out of the approach spans and the distributing truss.



Deck of New Bridge Showing Track on Which Span Was Moved.

Experiments to determine the friction against sliding were made which showed about 13 per cent. Power was provided to overcome a friction of about 25 per cent., but judging by the ease with which the Lidgerwood moved the spans it looked as though 13 per cent. was about the amount which actually existed. As it was impossible for the distributing truss to act during the last 20 ft. of travel, wedges were driven between the center shoes and the end floor beam when the forward shoe of the distributing truss reached the end of the deck truss. For the remaining 20 ft. of travel the whole load was thrown on this blocking. The end panel of the floor was reinforced to carry this load.

Three hours were consumed in moving the first span and about two and one-half hours for the second, the latter being inclusive of the time required to allow eight trains to pass, to adjust the anchor and to dismantle a part of the sliding

frame to allow it to pass the hauling sheaves during the last 20 ft. of travel. The net moving time was only 28.5 min. It was decided to operate the bridge as a double track structure during the winter in order to accommodate the heavy railway traffic at this season. Later the up stream track will be temporarily closed while the two up stream channel trusses are dismantled and the two new ones replacing them are erected in the same manner as described for the two down stream trusses.

The reconstruction of this bridge is being handled under the direction of P. B. Motley, engineer of bridges of the Canadian Pacific, and J. M. A. Fairbairn, assistant chief engineer. The superstructure was fabricated and erected by the Dominion Bridge Co., Montreal.

CONDUCTORS' AND TRAINMEN'S DEMANDS.

The committee of managers of the eastern railroads on May 1 refused to grant the increased pay asked for by the conductors and brakemen, and issued a notice declaring the case to be more important than that of the engineers and the firemen combined. Some 100,000 conductors and trainmen on forty-three roads demand an additional $17,000,000, or 20 per cent. per annum, though their wages were increased by $30,000,000 per annum in 1910.

The committee's letter to Messrs. A. B. Garrettson of the conductors, and W. G. Lee of the brakemen, was in substance as follows: The increase demanded would be equivalent to placing on these properties a lien of $425,000,000 of 4 per cent. securities, which would have preference over first mortgage bonds. If the railroads are forced to pay extravagant wages to men in train service, the burden must fall on the public, from which the roads must secure revenue.

"Already the traffic of a growing country has overtaxed the existing facilities; and the heavy burdens incurred through ill-advised legislation, such as extra crew bills—for which the Brotherhood of Railroad Trainmen is alone responsible—forcing on the railroads and consequently on the public, needless expenditures of millions of dollars annually, or the large financial outlay the roads are compelled by law to make for improvements which produce no revenue, such as the grade crossing bill of New Jersey, and the additional burden of previous wage increases, are making it impossible for many of the roads to provide those facilities which prudent foresight demands, and which the interests of the public require.

"In making demands for extravagant wages—wages entirely out of accord with the railroads' obligations as a whole—railway employees apparently act on the assumption that a strike that would tie up traffic would never be permitted by the public. They seem to think that if a strike is to be avoided, the railroads must give way—that the public will force them to give way, believing that arbitration must take place, and that in the end the splitting of differences between what they demand and the wages they receive will result in their favor. In other words, the employees have everything to gain and nothing to lose.

"The ability of the railroads to meet the recurring demands for increased wages is measured by the net results of their operations and the sum of the obligations which they must meet to maintain their solvency. The reduction of the net revenue by the constantly increasing expenses of operation have so narrowed the margin which is essential to the solvent existence of many of the roads that further increases in operating costs are viewed with grave concern. The railroads reiterate their statement made to the engineers, that this headlong movement towards financial disaster cannot proceed unchecked.

"The conductors and trainmen in the eastern district have practically uniform wages and working conditions, and the wages now paid are liberal. As positive proof of this we need only call to your attention the fact that they were fixed by E. E. Clark, former president of the Order Railway Conductors, and P. H. Morrissey, former president of the Brotherhood of Railroad Trainmen, who acted as arbitrators in the New York Central controversy in 1910. The method of settlement under which those wages and conditions were adopted was agreed to only after representatives of the employees had declined to accept mediation or arbitration under the federal law, arbitration by a board composed of members of the Public Service Commission, Second district, state of New York, or arbitration by a board composed of the presidents of the chambers of commerce of three prominent cities of the state of New York, or in fact, arbitration of any form. Therefore, to avoid suspension of traffic, and the hardships and inconveniences which would result, representatives of the New York Central offered the only method of settlement that the representatives of the employees would accept.

"To prevent strikes on their lines, practically all of the railroads in the eastern territory in 1910 accepted the Clark-Morrissey award. The wages and working conditions of the conductors and trainmen, fixed by the New York Central award, are probably more favorable than those of any other class of railway employees; and further, to quote the well-considered language of the Interstate Commerce Commission, 'railroad labor, certainly organized railroad labor, is probably as well paid, and some say better paid, than labor of other kinds upon the average.'

"As showing the increased cost to the eastern railroads of these adjustments in 1910, we need only quote the statement made by the president of the Brotherhood of Railroad Trainmen in his report to the tenth biennial convention of that organization: 'Conservatively estimating, the increase in the rates of pay of conductors, trainmen and yardmen in the East as a result of this movement will approximate $30,000,000 per annum.' No conditions of work have arisen since the application of the Clark-Morrissey award that would warrant any increase in wages or changes in working conditions.

"In view of the fact that the present rates of wages are liberal, and in many cases excessive, the committee, acting in the interest of owners of railroad securities, in the interest of all railroad employees—in the interests of the public as a whole—must decline your request."

The next day after receipt of this letter Messrs. Garrettson and W. G. Lee offered to arbitrate under the Erdman act; but that the managers declined to do, reiterating the statement that no conditions have arisen since 1910 to warrant any increase in wages or changes in working conditions. They added:

"As to arbitration under the law, it was only at the urgent request of the representatives of the government, and under the strongest protest the managers were able to voice, that, feeling that some adjustments of pay were due the firemen, they agreed to arbitrate the firemen's wage controversy under the Erdman act. At that time we put the public on notice as to the crisis that would confront them when the conductors and trainmen made similar demands.

"You have followed the example of the engineers and the firemen, and have proposed to arbitrate 'under the law,' though practically all the leaders of railway labor organizations recognize the defects of the present law by joining in an effort to have it amended."

Continuing, the letter recounts the objections to the Erdman act, and ends with a refusal to accept the brotherhoods' proposal.

The brotherhoods announced that they would proceed to take a "strike vote."

RAILWAYS IN TRIPOLI.—The Italian minister for the colonies has under consideration projects for the construction of the following railways: (1) From Tripoli to Homs and Misurata; (2) from Tripoli to Zuarah as far as the Tunisian frontier; (3) and from Tripoli to the Oasis of Ghadames.

REPORT ON TERRE HAUTE COLLISION.

The Interstate Commerce Commission has issued a report, made by Inspector Belnap, on the rear collision of passenger trains on the Vandalia at Terre Haute, Ind., January 8, when five persons were killed and twelve were injured. Eastbound train No. 8 was standing at the station and No. 20, following, came on at uncontrolled speed and ran into the rear of the standing train. The accident occurred in the middle of the day and ordinarily the engineman of the approaching train would have seen the standing train, but steam from locomotives standing at the west end of the train shed cut off his view. There is no block system in effect through the station; and, apparently, the only rule which would limit the speed of a train coming into the station is a municipal ordinance making the limit twenty miles an hour within the city limits.

Train No. 8 is scheduled to arrive in Terre Haute at 12:45 p. m., and to stop there one hour; at 1:45 it is due to start east. Usually the cars are set off on a siding, but in this case the train arrived 46 minutes late, and it remained on the main track. Train No. 20 is due to arrive at 12:55, but on this day it was late and arrived at 1:42; and No. 8 was struck three minutes before it would have departed. The engineman of No. 20 admitted that he did not think of No. 8 and did not know what its leaving time was. No. 8 was not protected by a flag and it does not appear that any trains are thus protected at this station; and Mr. Belnap says that the direct cause of the collision was the failure of the conductor of No. 8 to protect his train, knowing that No. 20 was due. The engineman of No. 20 is also declared to have been directly at fault, for not having his train under complete control, his view into the train shed being obscured. Stationmaster Stice said there were no rules requiring flagging in the station, and he had received no instructions on the point; being a union station, where everybody stops, he held that every train should approach the station under control. Another road which crosses the Vandalia at the east end of the station has a rule requiring protection by flag when trains are standing at the station. Stationmaster Stice admitted knowledge of this rule, but said that where a trainman stood in a union station with a flag in his hand, it looked foolish to him. Since this collision the trainmaster has been instructed to enforce the flagging rule at Terre Haute union station to the same extent as at other places on the road. The inspector concludes with the statement that enginemen could be warned on approaching the station by means of a fixed signal located [at a point named] west of the station; and he says that there should also be a very material decrease in the speed at which trains are permitted to run approaching the station.

TRAFFIC THROUGH THE SAULT STE. MARIE CANAL.

The annual statistical report on lake commerce passing through the canals at Sault Ste. Marie, Mich., and Ontario during the season of 1912 has been issued by Lieut. Col. Mason M. Patrick, of the U. S. Army Corps of Engineers. The total freight traffic through both the American and Canadian canals, of 72,472,676 short tons for the season of 1912, shows an increase of 36 per cent. over the previous year. All items of freight show an increase except coal, salt, copper and building stone. The season of navigation continued for a period of 7 months and 26 days. The traffic through the American canal was 45 per cent. of the total freight and 55 per cent. of the total net registered tonnage, while the traffic through the Canadian canal was 55 per cent. of the total freight and 45 per cent. of the registered tonnage.

The following general summary shows the principal statistics of the traffic through both canals:

Total freight carried, tons	72,472,676
Total tons net register	56,736,807
Total mile-tons	60,242,833,014
Total valuation placed on freight carried	$791,357,837
Total amount paid for freight carried	$40,578,225
Total number of registered vessels using canals	853
Total number of passages by unregistered crafts carrying freight	535
Total valuation placed on registered vessels	$138,546,300
Total number of passengers transported	66,877
Average distance freight was carried, miles	831
Average cost per ton for freight transportation	$0.56
Average cost per mile per ton, mills	.67
Average value per ton of freight carried	$10.92
Time American canal was operated, days	237
Time Canadian canal was operated, days	240
Freight carried by—	
Registered vessels, tons	72,300,591
Unregistered vessels, tons	172,085
American vessels, per cent	94
Canadian vessels, per cent	6
Passengers carried by—	
American vessels, per cent	32
Canadian vessels, per cent	68
Average number of vessels passing per day—	
Through Poe lock	39
Weitzel lock	27
Canadian lock	33
Poe, Weitzel and Canadian locks	95

Of the total traffic 55,377,687 short tons was eastbound, and 17,094,989 was westbound. The transportation charges, including loading and unloading, on freight passing through both canals were:

Articles.		Quantity.	Rate per unit.	Amount.
Coal	Short tons	14,931,594	$0.30	$4,479,478.20
Flour	Barrels	8,652,153	.20	1,730,430.60
Wheat	Bushels	174,086,456	.025	4,352,161.40
Grain, other than wheat	Bushels	69,024,546	.025	1,725,613.65
Manufactured iron	Short tons	629,060	2.00	1,258,120.00
Pig iron	Short tons	25,832	1.00	25,832.00
Salt	Barrels	660,991	.10	66,099.10
Copper	Short tons	116,954	1.45	169,583.30
Iron ore	Short tons	46,303,423	.45	20,836,540.35
Lumber	M. ft. B. M.	667,542	2.65	1,768,986.30
Silver ore	Short tons	.....	....	.....
Building stone	Short tons	2,282	1.50	3,423.00
General merchandise	Short tons	1,664,783	2.50	4,161,957.50
Total				$40,578,225.40

The total expenditures for operating and repairs on the American canal for the year 1912 are given in the report as follows: Operating, $71,135.66; repairs, $81,061.68; total, $152,197.34. The cost per freight ton was 4.64 mills.

The following table of yearly summaries since 1887 shows the steady increase in the volume of the traffic:

Year.	Total freight. Short tons.	Valuation of freight.	Freight charges.	Average haul. Miles.	Freight charges per mile-ton. Mills.	Value of American craft.	Value of Canadian craft.
1887	5,494,649	$79,031,757	$10,075,153	811.4	2.3	$17,684,550	$2,089,400
1888	6,411,423	82,156,019	7,883,077	806.4	1.5	20,381,100	1,514,300
1889	7,516,022	83,732,527	8,634,246	790.4	1.5	25,328,600	1,597,600
1890	9,041,213	102,214,948	9,472,214	797.2	1.3	27,857,700	1,777,800
1891	8,888,759	128,178,208	9,849,022	820.4	1.35	31,947,300	2,119,500
1892	11,214,333	135,117,267	12,072,850	822.4	1.31	36,220,100	2,108,700
1893	10,796,572	145,436,957	9,957,483	831.9	1.1	39,017,400	2,115,700
1894	13,195,860	143,114,502	10,798,310	821.1	.99	41,124,200	1,959,800
1895	15,062,580	159,575,129	14,238,758	830.0	1.14	40,858,800	2,037,000
1896	16,239,061	195,146,842	13,511,615	836.4	.99	43,006,200	2,135,300
1897	18,982,755	218,235,927	13,220,099	841.3	.83	42,375,700	2,001,400
1898	21,234,664	233,069,740	14,125,896	842.6	.79	45,199,800	2,491,900
1899	25,255,810	281,364,750	21,959,707	827.2	1.05	65,000,520	3,369,600
1900	25,643,073	267,041,959	24,953,314	825.9	1.18	66,116,583	3,618,576
1901	28,403,065	289,906,865	23,217,974	823.3	.99	57,244,200	3,311,900
1902	35,961,146	358,306,300	26,566,189	827.4	.89	67,205,000	3,792,400
1903	34,674,437	349,405,014	26,727,735	835.6	.92	68,252,800	6,384,500
1904	31,546,106	334,502,686	21,552,894	843.5	.81	63,789,300	5,377,100
1905	44,270,680	416,965,484	31,420,585	833.3	.85	73,211,300	5,429,000
1906	51,751,080	537,463,454	36,666,889	842.4	.84	88,392,000	6,140,500
1907	58,217,214	569,830,188	38,457,345	828.3	.80	102,525,500	7,918,000
1908	41,390,557	470,141,318	23,903,244	842.0	.69	101,643,000	10,054,000
1909	57,895,149	626,104,173	36,291,948	809.0	.78	116,192,000	10,707,000
1910	62,363,218	654,010,844	38,710,904	840.0	.74	123,061,500	11,675,000
1911	53,477,216	595,019,844	29,492,196	826.0	.67	109,336,000	12,211,500
1912	72,472,676	791,357,837	40,578,225	831.0	.67	125,618,800	12,927,500

PARAGUAYAN-BRAZILIAN CONNECTION.—The connecting up of Brazil and Paraguay by railway is to be further assured by running a line from the capital of Paraguay, Asuncion, northeasterly to the Paraguayan-Brazilian frontier, where it will cross the Paraná river. From that point it is proposed to connect with the Transcontinental Brazilian line, which again connects with the main Brazilian system at Itapetininga.

PRINCIPLES OF ELECTRIC RAILROADING.*

Second Article. Formulas Developed for Calculating the Amount of the Forces of Inertia, Gravity and Friction.

By C. L. de Muralt,
Professor of Electrical Engineering, University of Michigan.

In the first article of this series (*Railway Age Gazette*, April 4, 1913), we reviewed in a general way the laws which underlie all movement of trains on tracks.

We found that to move any railroad train we must apply a force of sufficient magnitude to overcome the combined influence of what might be termed three great natural forces, namely, (1) inertia, (2) gravity, and (3) friction. We will now proceed to calculate the amount of each of these three forces.

INERTIA.

We defined inertia as the force of the mass, which tends to prevent any change in speed, be it increase or decrease. To overcome inertia we must supply a force which is proportional to the weight of the train and also to the rate at which the speed is to be changed. This may be expressed as follows:

$$f_i = 100\ W\ A, \qquad (1)$$

where W represents the weight of the train in tons, A the rate of acceleration—or retardation in the case of braking—in miles per hour during one second, and f_i the force in pounds which it takes to accelerate—or retard—the weight W at the rate A.

The mathematical proof of this equation is comparatively simple. We may start from the familiar physical relation that force equals mass times acceleration:

$$f_i = m\,a.$$

Inasmuch as mass equals weight divided by the acceleration due to gravity, we may write

$$m = \frac{w}{g},$$

and inasmuch as g has been determined to be roughly equal to 32.2, the above formula becomes:

$$f_i = \frac{w\,a}{g} = \frac{w\,a}{32.2}$$

where f_i is in pounds if w, the weight, is in pounds and a is the change of speed in feet per second per second.

If we change to the more usual units of tons and miles per hour, this equation becomes:

$$f_i = \frac{2{,}000\ W \times 5{,}280\ A}{32.2 \times 3{,}600} = 91.1\ W\,A,$$

where W is the weight of train in tons and A the rate of acceleration in miles per hour per second.

This gives us the force in pounds, which is required to overcome the inertia of the train, on the assumption, however, that the motion of the train is a motion of the train as a whole and that there is no relative motion between any of its individual parts. In reality this is not so. The wheels and axles and other similar parts have a rapid rotating motion in addition to their forward motion. They act as so many flywheels and they require the expenditure of a certain amount of additional energy to get them to turn.

The amount of this energy, or for that matter the amount of energy in any rotating body, is determined by finding the weight of the body and the position and velocity of its center of gyration. The latter is the point at which we may imagine the whole mass of the rotating body concentrated, and any given force would produce the same velocity of rotation as it does in the actual body. It is needless here to go into detail as to how the radius of gyration is determined. Suffice it to say that for car wheels it is somewhere near 0.7 of the actual radius of the wheel, for locomotive wheels about 0.8, and for the rotating part of electric motors about 0.6. In round numbers we may say without any great error that the rotative energy of these parts is on the average equal to about one-half of the energy due to their forward motion ($0.7^2 = 0.49$).

If we compare the weight of wheels, axles, etc., with the total weight of the cars and locomotives, we find that the rotative energy will add to the energy of the train as a whole, from 5 per cent. in the case of a heavily loaded train to 12 per cent. in the case of an empty train, or about 9 per cent. on the average. To take account of this rotative energy we must therefore increase the amount found above for $f_i = 91.1\ W\ A$ by about 9 per cent. This gives us the formula: $f_i = 100\ W\ A$, which was to be proven.

Thus we have the simple rule that it takes 100 lbs. to accelerate one ton at the rate of one mile per hour per second; and the total force required in any case can be readily and accurately calculated by multiplying the weight of the train in tons by the rate of change of speed in miles per hour per second and by 100.

For instance, let us take a train which weighs 400 tons, and let us assume that it is desired to bring this train up to a speed of 30 miles per hour in 60 seconds. This corresponds to an average acceleration of 0.5 miles per hour per second, and the average force which we must apply to overcome inertia during the acceleration period is:

$$f_i = 100 \times 400 \times 0.5 = 20{,}000\ \text{lbs.}$$

GRAVITY.

It is not much more difficult to calculate the force necessary to overcome gravity. Whenever a grade is encountered, we must lift the train through the vertical distance represented by the grade. Grades are nowadays generally expressed in per cent., meaning, that there is a rise of p feet for every 100 ft. horizontal length of line. If the grade should be given as x feet rise per mile, all we have to do is to divide x by 52.8 to obtain p, the rise per 100 ft. In Fig. 1 let the force OW represent the weight W of the car O. It acts vertically downward, but may be considered as resolving itself into two component forces, the force $F_g = OG$ acting parallel with the rails and tending to produce motion down the grade, and the force $F_n = ON$ acting normal to the rails and representing the pressure of the wheels on the rails. Force F_n is absorbed by the rails. Force F_g is the force which must be overcome and which we are trying to calculate. It is geometrically evident from Fig. 1 that, on account of the similarity of the triangles ABC and WOG, the force $F_g = OG$ bears the same ratio to the weight $W = OW$ that the rise BC does to the length of line AB. On any ordinary railway grade the horizontal distance AC is not sensibly different from the length measured along the surface of the rails AB. For a 3 per cent. grade, for instance, the length measured horizontally, AC, is to the length measured along the slope, AB, as 100 to 100.045. Hence it is customary

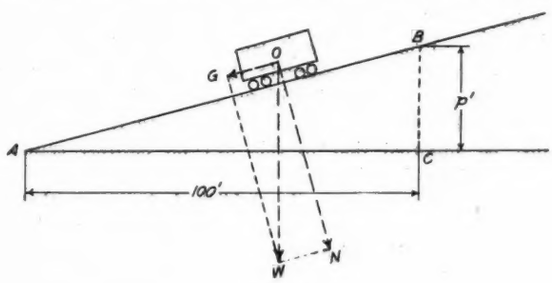


Fig. 1.

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and proper to assume $AC = AB$.* Therefore we have, approximately:

$$\frac{F_g}{W} = \frac{BC}{AC}$$

$$\text{or: } F_g = W \times \frac{BC}{AC}$$

If we let the horizontal distance $AC = 100$, and the height $BC = p$ = rate of grade or rise in per cent., then we have:

$$F_g = W \times \frac{p}{100}$$

This means that for every foot rise in 100 ft. length, and for every ton train weight, we have to exert a force equal to the one hundredth part of a ton to lift the train up the grade. Changing to the more usual unit of pounds we have:

$$f_g = 2{,}000\ F_g = 2{,}000\ W \times \frac{p}{100}$$

$$\text{or: } f_g = 20\ W\ p, \qquad (2)$$

where W represents the weight of the train in tons, p the grade in per cent. (feet rise per 100 ft. length) and f_g the force in pounds which is required to lift the weight W up the grade p.

Thus we find that, to calculate the force which it takes to lift a train up a grade, we simply multiply the weight of the train in tons by the rate of the grade in per cent. and by 20.

For instance, to take a train of 400 tons up a grade of 2 per cent., it requires to overcome the force of gravity a force:

$$f_g = 20 \times 400 \times 2 = 16{,}000 \text{ lbs.}$$

FRICTION.

To calculate the force which is necessary to overcome friction is slightly more involved. This is because the amount of this force depends on various factors which are subject to considerable variation. For instance, we all know that the friction inside a bearing is different when the bearing is hot from what it is when it is cold. We also know that the friction between wheels and rails depends on whether the rails are laid on a tangent or in a curve, and whether they are dry or moist, or covered with sleet or snow or wet leaves, etc. The friction between train and surrounding air varies according to whether it is a calm day or there is a heavy wind in favor or against the train. Then we have differences due to the effect of variations in speed, load, temperature, size and form of cars, length of train, etc. From all this it would appear that the best we can expect to do is to estimate the friction as accurately as possible for the various conditions or combinations of conditions. This has been done by a great many investigators, but it must be admitted that to this day no entirely satisfactory solution has been found which is applicable to all cases.

It seems to be pretty well established, however, that there are essentially two parts to train friction. One part increases directly in proportion with the train weight; the other part is independent of train weight, but increases with the number of cars that go to make up the train. This can be expressed in a formula as follows:

$$f_t = x\,W + y\,n,$$

where x and y are factors, the value of which has yet to be determined, W stands for the train weight in tons, and n for the number of cars in the train. Inasmuch as the number of cars is equal to the train weight divided by the average weight per car, we may write:

$$n = \frac{W}{W'},$$

where W' represents the average weight per car, and the above formula then becomes:

$$f_t = x\,W + y\frac{W}{W'} = W\left(x + \frac{y}{W'}\right),$$

which simply means that, instead of saying that there are two parts to train friction, one proportional to the train weight and the other to the number of cars, we may say that friction as a whole is proportional to the train weight, but a portion of it varies in direct proportion to the train weight and another portion varies inversely as the average weight of each car. The two ways of expressing it mean the same thing, and they both relate to the well recognized fact that in certain of the items which go to make up train friction we find train weight as the dominant factor, while in others the composition of the train is all-important, and the latter items are much larger if the total train weight is made up of a great number of empty cars, than if it represents a small number of heavily loaded cars. This was well recognized by the American Railway Engineering Association, when it adopted at its annual meeting in 1910 the following formula for train friction:

$$f_t = 2.22\,W + 121.6\,n.$$

This formula is based on the assumption that the friction of the train is uninfluenced by any change in speed. As a matter of fact, the association in establishing this formula, had in mind freight trains running at speeds between 7 and 35 miles per hour, and it is quite likely that within these limits the variation in the amount of friction, if any, is very small and its numerical value very hard to establish.

If we wish to have the formula applicable to higher speeds as well, then the influence of change in train speed upon train friction should have due consideration. The writer, after a careful and laborious study of all available test data, has come to the conclusion that the following simple formula represents average conditions in this respect fairly well:

$$f_t = \left(2 + \frac{V}{10}\right) W + 90\,n = W\left(2 + \frac{V}{10} + \frac{90}{W'}\right) \qquad (3)$$

where, if V represents train speed in miles per hour, W weight of train in tons, n number of cars, and W' average weight per car in tons, f_t will be the total train friction in pounds. Values established according to this formula check fairly well with values obtained according to the formula of the American Railway Engineering Association for speeds between 5 and 20 miles per hour. For higher speeds formula (3) gives more conservative values.

Whichever formula is used, it is necessary to realize that there are still some conditions which may influence the value of train friction and which are not particularly covered in either formula, such as condition of cars, condition of track, weather, etc. Variations of this sort it is impossible to determine mathematically. Any formula for train friction must be assumed to apply to cars in good average condition, track of good average first-class construction and reasonably good maintenance, and fair wind and weather. For special deviations from these assumptions special allowances must be made.

When trains are first started their friction is likely to be considerably greater than is indicated by the above formula. It may under adverse conditions run up as high as 40 lbs. per ton train weight. But trains are started by increments so that starting friction rarely becomes a limiting factor, especially not, because stops are not usually made on ruling grades.

The effect of curves, however, upon train friction is of sufficient importance to be carefully considered in this connection. In modern railway practice, curves are generally compensated by a reduction of grade so that the locomotive effort is the same on the curve as on the tangent. A compensation of 0.035 per cent. per degree of curvature seems to give the best average results. If curves are thus compensated then there is no necessity for considering any addition to train friction on their account. Curves that are not compensated are assumed to add 0.7 lbs. per ton train weight to the train friction for every degree of curvature, and the train friction as obtained by formula (3) should be increased by that amount.

Thus, for instance, a train composed of 50 cars of an average weight of 40 tons per car, running at a speed of 20 miles per hour through an uncompensated curve of 4 deg., will have a total train friction on the level of:

$$f_t = 2{,}000\left(2 + \frac{20}{10} + \frac{90}{40} + 4 \times 0.7\right) = 18{,}100 \text{ lbs.}$$

In the following articles we will show how the above formulas are used in making comparative power calculations for steam and electric operation.

ANNUAL MEETING OF THE AIR BRAKE ASSOCIATION.

Proceedings for First Two Days, Including Papers on Undesired Quick Action and Operation of Long Freight Trains.

The twentieth annual convention of the Air Brake Association was held in St. Louis, May 6-9, W. J. Hatch, of the Canadian Pacific, presiding. The meeting opened with a prayer by Rev. C. E. Jenney, and the association was welcomed to the city by T. H. Rogers, secretary to the mayor.

President Hatch spoke of the part the air brake played in the economical and safe operation of trains, advocating the testing of air brakes as soon as the train arrives at the terminal; he also recommended the installation of yard testing plants. Speaking of air hose failures he raised the question as to whether or not it would be practical to limit the life of a hose, rather than have it fail in service, causing train delay. The secretary's report showed 788 members and a cash balance of $2,619. About 220 members registered the first day.

An informal meeting was held Tuesday afternoon for the discussion of topics of interest not included in the program. E. F. Kearney, general superintendent of transportation of the Missouri Pacific, addressed the convention Wednesday morning. Wednesday afternoon was given over to an informal talk by Walter V. Turner of the Westinghouse Company, who spoke on topics suggested by the members in attendance.

UNDESIRED QUICK ACTION.

A paper on "Undesired Quick Action, Its Prevention and Remedy," was presented by C. N. Remfry, of the Duluth, Missabe & Northern. He told of the difficulties that had been experienced by that road, which has 7,000 ore cars and 2,000 freight cars. The ore cars do not leave the system, and are therefore under the company's observation during the entire year. They are in service during the open season of the Great Lakes, which is approximately from April 15 to November 30. At the close of the season the brakes are cleaned and lubricated. Each ore car will average one round trip of 190 miles every 24 to 36 hours, and is examined by air brake inspectors after each trip. The terminal yard at Proctor, Minn., has 97 tracks, all of which are piped with air test lines. Sufficient air capacity is provided to charge 5 trains at once to a pressure of 90 lbs. The cars are braked at 95 per cent. on a 50-lb. brake cylinder pressure.

Prior to and including the year 1906 the triple valves were cleaned on the cars by removing the triple cap and check valve case, wiping the parts as clean as possible, and oiling the slide valve and slide valve piston. This method would give satisfactory results until warm weather, when the undesired quick action would develop on nearly all trains. It was believed that the accumulation of rust in the pipes and the ore dust working into the pipes would cause the triple to stick enough to hold the pressure until it became great enough to move the piston to the emergency position. With this idea in view the triples were given a much more thorough overhauling and the pipes were hammered and blown out, but in the following year the trouble was worse than ever. Drawbars were pulled out and the equipment became more or less weakened, putting about 20 per cent. of the cars out of commission. At the end of the season, however, the triple valves seemed to be in as good condition as when the brakes were cleaned. A large number of the triple valves were then sent to the Westinghouse works at Wilmerding, Pa., for closer examination.

As a result it was decided to only blow out the air pipes, to give special attention to the cleaning of the triple valves, to use gasolene instead of kerosene in the cleaning, and to lubricate the slide valves with a high grade of fine dry graphite, and the triple piston with a good grade of grease or oil. This gave the desired result, and at the end of the 1909 season there were only six cases of the undesired quick action. In each of these six cases it was found that oil on the slide valve caused the trouble. The following table shows the effects obtained by using the dry graphite:

Year.	* Trains south with loads.	* Trains north with empties.	** Emergency trains reported.	Cause.
1907	6,878	6,672	375	
1908	4,021	3,897	4,021	
1909	**5,946**	**5,625**	**6**	**Found lubricant on slide valve in each case.**
1910	5,929	5,653	0	Mechanical defect. Wings of slide
1911	3,092	2,898	1	valve riveted too tight, causing
1912	4,536	4,347	0	graduating valve to bind.

* Hill trains not included.
** Trains developed undesired quick action more than once during the trip. No record kept of the number of times undesired quick action took place. No record kept of the cars in each train. It is assumed that a large percentage of the trains contained almost the same identical cars, therefore it is safe to say that list includes trains which developed this trouble several times but on different trips.

Trouble was also experienced because of the brake cylinder lubricant becoming thinner in summer, due to the heat. This has been overcome by the use of the emery brake cylinder lubricant, which was adopted as standard after 1910.

Discussion.—This is one of the most important matters related to train operation, as the undesired quick action of the triple valve causes train detentions, a decrease in the safety of train operation and a considerable increase in the cost of equipment maintenance, due to the general weakening of the equipment, drawbars pulling out, etc. It was stated that there were no less than 42 contributary causes to undesired quick action.

Other roads using graphite on the triple valve slide valve could not report as great a reduction in the undesired quick action as did Mr. Remfrey in his paper. This was due to the fact that Mr. Remfrey's cars were always under his direct supervision and that on the ore trains no foreign cars were used. Another reason for Mr. Remfrey's success was that throughout the whole scheme of air brake maintenance the utmost care was used, his road believing that money spent in that way was well invested. Many experienced difficulties with dry graphite, on account of surplus oil in the brake cylinder working back on the slide valve and of water in the train pipe getting on the slide valve. This was shown by W. V. Turner, of the Westinghouse Company, to completely nullify the effect of the dry graphite, for, as stated, the advantage of the dry graphite was to allow the air to percolate through the graphite, thereby reducing the pressure of the valve on its seat and allowing it to start with a less difference in pressure between the auxiliary reservoir and the train pipe. It seemed to be the consensus of opinion that the utmost care must be taken in air brake maintenance and that dry graphite was a very great help in reducing the undesired quick action.

OPERATING LONG FREIGHT TRAINS.

F. B. Farmer, Westinghouse Air Brake Company, presented an interesting and instructive paper on "Starting, Running and Stopping Long Freight Trains," which included valuable instructions to engineers of freight trains. An abstract of the paper follows:

Next to safety comes the less spectacular, but very potent, argument of needed economy in cost of transportation. An editorial in the *Railway Age Gazette* of February 7, 1913, says: "From 65 to 80 per cent. of the damage to freight cars is caused by defective draft gears," basing this on a statement by a master car builder of a large road. Part of this damage is caused in train handling, and while inherently weak draft gear and gear allowed to leave terminals in a defective condition contribute to break-in-twos, yet, as good handling will, even under such adverse conditions, avoid many failures that occur, the opportunities for improvement are obvious.

Passenger train handling must not, and usually will not, be

neglected because the errors are generally observed and complained of. This is much less true of freight train handling, yet note what authorities have to say about the earning capacity of the humble freight car. While the editor of a prominent technical paper estimates the average earning power of a freight car as $2.50 per day, J. M. Daly, general superintendent of transportation of the Illinois Central, in a committee report on "How to Secure Maximum Use of Freight Cars" (*Railway Age Gazette*, October 11, 1912), gives the following:

"The freight car today is the best asset of the railroad. It earns 75 per cent. of our gross revenue, and during the busy season is, without doubt, the best freight solicitor we have. The earning capacity of each freight car on the Illinois Central per day is $2.34. Eliminate Sundays, holidays and bad-order cars and confine it to the busy season, and its gross earning capacity is about $3.85 per day, the net revenue being about $1.15 per day. Five years ago the presidents of five of the largest systems made a thorough investigation covering the cost per day of cars. It was found at that time to be 42 cents and had for several years increased approximately two cents per day per annum. At that rate, cars today cost the owner 52 cents per day, covering interest and repairs."

On an earning value of $3.85 per day a delay of thirty minutes each day to a 60-car train would total $144 per month. This considers but one train delayed by a break-in-two or other cause, yet often others are delayed by it. This $144 is merely the loss of possible earnings. There is also the direct loss due to the damage done, time of crews, extra fuel burned, etc. Railways are run for profit, but with legislative restrictions, increased taxes and higher costs for material and labor this end is steadily becoming more difficult to attain. Hence, we who are paid to contribute to this needed result should endeavor to do our part well. Our efforts, then, should be toward keeping trains moving toward destinations without damage. That this may be done, and safely, requires, of course, some standing time for testing and repairs, but this merely emphasizes the need of avoiding unnecessary damage and delay.

Air Brake Instruction.—The instruction facilities of an air brake instruction car, including the instructor, are of value in so far as they contribute to safer, more expeditious and more economical train movement and no farther. The instructor, to succeed, must realize, and ever keep in mind, that the air brake is a *means* and *not* an *end;* that it is to promote train movement as far as is compatible with safety and economy; that this is obtained largely in train handling (starting, running and stopping), and that all instructions on train handling should be based on the fundamental and all-important fact that with draft rigging in fair to good condition no damage in train handling (not including switching) will follow if the slack is not allowed to run in or out harshly. All instruction on train handling must be based on and tied to train slack control, must teach engineers the various causes for slack running in and out, and how to use the brakes, the steam and the sand to prevent harsh slack action. If the instructor does not include the proper use of steam and sand he has left an unfinished job. The same is true if he fails to teach all concerned that slack must be pulled out to enable car inspectors to locate some draft gear defects, or if he fails to teach car men what draft gear defects are contributing unduly to break-in-twos.

The fundamental need, train slack control, is simple, but its accomplishment is not, and the instructor who can and does teach engineers how to attain the desired end is their and the company's man; he has realized the main object of his position. The instruction car work is merely the beginning, and if it is not followed up by individual instructions and observations on the road the results will be disappointing and out of proportion to the time expended. If either must be slighted it should be the car instructions.

Break-in-Two Records and Investigations.—Break-in-twos afford the best measure of the quality of train handling. Without reasonably accurate and complete records of every break-in-two officials are working largely in the dark, and accurate and complete reports are impossible without suitable forms. The importance of investigations and the necessity for suitable report forms are indicated in the following extract from a committee report made at a meeting of operating officials of the Illinois Central by J. L. East, agent of the loss and damage bureau: "The matter of rough handling of trains can be readily corrected if those connected with the transportation department holding supervisory positions will follow up closely with their superior officers any rough handling of trains coming under their observation in a sufficiently perceptive manner, to enable proper investigation of each specific case. It should be possible to surround this whole question of rough handling of trains on road, as well as in terminal yards, with such close and constant supervision through the co-operation of the entire division staff, as to make possible a thorough investigation of at least the majority of cases of rough handling occurring on any division. This is a matter of the most importance, and there is no question but that a great improvement in the way of reducing claims can be made."

The superintendent should receive a monthly tabulation of break-in-twos and should compare months on a train-mileage basis so as to note promptly and take action on any decreased efficiency. This tabulation is made up easily by the receiving clerk making entry on a suitable form as each report passes through his hands, requiring but a few minutes per day at the most, yet permitting of a tabulation ready for copying on the first of each month. A copy to the general superintendent allows him to compare months for each division and different divisions. On at least one large road the general manager takes personal interest in the monthly tabulations.

Train Handling.—Draft rigging in fair to good condition is not pulled out. It is either driven in or jerked out, both implying a severe blow. The severity cannot be judged by any shock felt by those riding trains, particularly the engineer of a heavy locomotive. Engineers who do not understand this are prone to attribute resulting failures to the condition of the draft rigging instead of to their handling. Another over-worked explanation for draft gear failures is "old defect." Many of such should be called ancient defects. Not infrequently it is an original one in an old coupler.

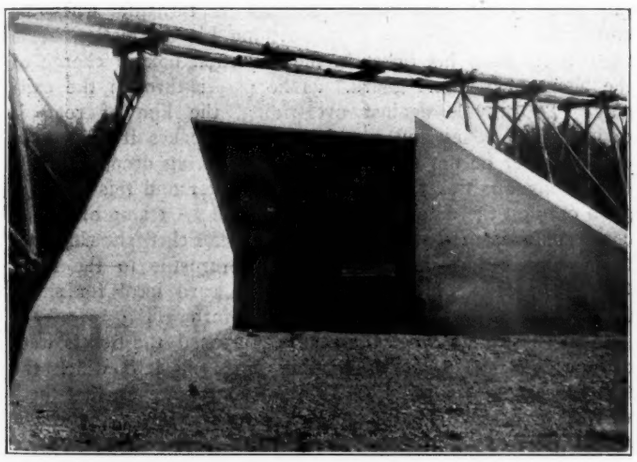
Records show, regarding break-in-twos with ordinary freight trains of from 1,700 to 2,400 tons, that 20 per cent. to 25 per cent. occur within five cars from the engine; about 40 per cent. between the engine and tenth car, and 60 per cent. to 65 per cent. between the engine and twentieth car, conclusive proof that it is the harsh running out or pulling out of slack at the head end that does most of the damage in train handling.

Australian Railways Gage.—A conference of the chief engineers of the Commonwealth and state railway departments in Melbourne has urged the immediate adoption of a uniform 4 ft. 8½ in. gage throughout Australia. The estimated cost of carrying this into effect is $185,000,000.

Train Robberies in France.—As the result of a series of recent robberies from trains on the Paris, Lyons and Mediterranean, the police of Lyons and Dijon have lately been carrying out researches, which have just led to the arrest of five men and a woman, who are now accused of complicity in an organized series of daring thefts. Their *modus operandi* is said to have been as follows: All the robberies were committed at a place between Allerey and Chalon, where the trains run at reduced speed. One or more members of the gang would board the train at this point, entering a baggage car or freight car, and throw out valuable merchandise to a waiting confederate on the line. Among the stolen property found in the houses of the arrested persons were some 600 lbs. of silks and other textile goods, and quantities of brandy and absinthe. There were also discovered lithographic presses for the production of forged postage stamps and railway tickets.

DOUBLE TRACKING ON THE NASHVILLE, CHATTANOOGA & ST. LOUIS.

During the last two seasons the work of double tracking the Chattanooga division of the Nashville, Chattanooga & St. Louis Railway between Chattanooga and Stevenson, Ala., a distance of 38 miles, has been actively pushed. The Southern railway uses the tracks of the Nashville, Chattanooga & St. Louis from Stevenson to Chattanooga and the Alabama Great Southern also uses these tracks for six miles from Wauhatchie to Chattanooga. The combined service of these three roads has amounted to considerably over 50 trains a day. During the season of 1911 several sections of double track were put in service between Chattanooga and Shellmound, and this portion of the line was otherwise improved, as described in the *Railway Age Gazette* of November 17, 1911. One of the most interesting features of this work was the cutting out of service of a single track tunnel at the summit of Raccoon mountain, which had been built to carry slides over the track. In widening banks for the double track during the season of 1911 considerable slag from nearby blast furnaces was used. In one place where the line is located on a very precipitous slope between the Tennessee river and Raccoon mountain, this slag fill could not be kept from sliding because the footing at the river bank had



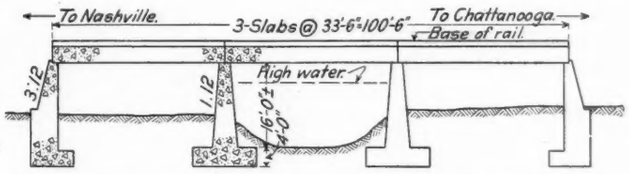
Typical Concrete Box Culvert on the N. C. & St. L.

given way. Having dumped considerably more material than should have been necessary for the bank widening, and the fill still showing tendencies to slide, it was decided to adopt some unusual measures to stop the trouble. A section of 4 in. pipe, 6 ft. long, was tapered to a 1 in. point and a number of 1 in. holes were drilled throughout its length. This pipe was then driven down through the slag. Another section of pipe was connected to its upper end and the driving was continued as long as possible, usually until the pipe had penetrated from 15 to 18 ft. When possible, the pipes were driven in vertically, but in a number of cases where it was easier to drive them on an angle, this was done. After the pipes were driven the driving cap was removed and additional joints screwed on with a 45 deg. elbow and a very thin grout was poured in from a high elevation so as to give hydraulic pressure. The grout was thus forced out through the holes in the pipe. As the pouring proceeded the pipes were withdrawn and a very solid core of cemented material was left. The fill so treated varied in height up to 50 ft., but the treatment was applied only to a strip extending entirely across the foot of the slide. Since the application of the grout, no further trouble has been experienced.

The work during the past year included double tracking and grade reduction between Stevenson and Shellmound. At Stevenson, on a section about two miles long, the southbound grade which begins at a stopping point for all trains, was reduced from 1.1 per cent. to 0.3 per cent. At Carpenter an undulating grade of 1.1 per cent. was reduced to a 0.5 per cent. grade for a distance of about three miles. Between Bridgeport and Bolivar, a new location has been made which will effect a reduction in grade and improve the alinement.

The Stevenson grade revision covering a distance of about two miles involved the lowering of the main track through two summits a maximum of 12 ft. and the raising of one sag a maximum of 10 ft., it being necessary to remove about 80,000 yds. of material. A steam shovel and 6, 8 and 12-yd. dump cars pulled by standard gage engines have been used by the contractor in handling this material. The material was principally red clay with some slate and a little solid rock.

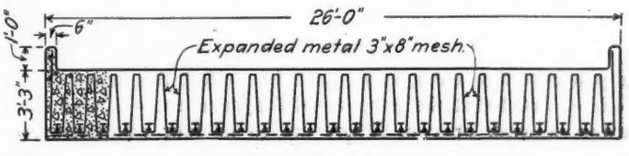
The new line between Bridgeport and Bolivar is about five



Longitudinal Section of Concrete Slab Bridge.

miles long and involved the handling of approximately 400,000 yds. of material; 50,000 of which were borrow. Two chert cuts in this section offered the only serious problem. This material could not be handled economically by a steam shovel without blasting. During the early stages of the work before the contractor had secured his supply of explosives, an attempt was made to handle it without blasting, the result being that a 70 ton shovel wore out a set of dipper teeth every day in handling about 250 cu. yds. In starting one of the deep cuts in this material an attempt was made to handle the upper portion with a team outfit in order to get the shovel in on a grade over which the cars could be handled. This failed, however, as it was impossible to plow the chert with a six mule team. It was finally necessary, in order to open up this cut, to make a light cutting with a steam shovel, wasting the material on the sides, then back out and start in again on a grade which would allow the loading of cars alongside the shovel. The cuts in this material were made about 40 ft. wide and no attempt was made to slope them, the width being sufficient to allow the sloughing which will occur. One of the reinforced concrete underpasses on this new line is shown in an accompanying cut.

The grade reduction at Carpenter required the handling of about 200,000 yds. of material, about half of which was from



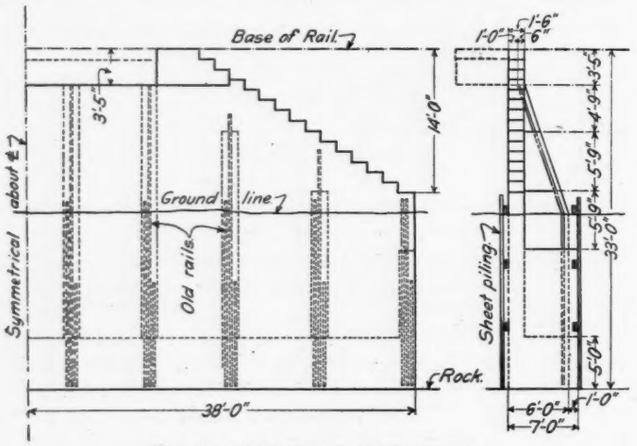
Detail of Slab.

borrow and was used in making a fill of maximum height of about 24 ft. The material was handled by a steam shovel into four yard cars pulled by dinky engines.

The standard roadbed width on this work was 33 ft. in both cuts and fills, slopes being 1½ to 1 for fills and 1 to 1 for cuts. The track is laid with 85-lb. rail on oak ties, tie plated. The ballast is rock.

Concrete slab bridges have been used in a number of locations on this road which have a reinforcement not commonly used. As shown in the cross section of one of these slabs, reproduced herewith, this reinforcement consists of old 80-lb. rails spaced 12½ in. center to center with their heads down and two inches above the bottom of the slab. Around these rails is bent a continuous sheet of expanded metal 3 in. x 8 in. mesh, and below the rails is placed a flat sheet of the same reinforcing

material. One of these bridges with clear spans of 31 ft. 6 in. has been built over Widow's creek, the slabs being built 33 ft. 6 in. long, allowing the use of 33 ft. rails without cutting. The depth of these slabs, 3 ft. 3 in., is somewhat less than the common practice in slabs of equal span reinforced with rods and stirrups. The three 33 ft. 6 in. slabs 26 ft. wide used on this bridge required 420 sheets of expanded metal 5 ft. x 10 ft. 8 in. weighing 0.6 lb. per sq. ft., and 75 pieces of second-hand 80-lb. rail. In one of these bridges a reinforced concrete abutment with reinforced buttresses was used, the design of which is shown in the accompanying drawing. The wall of the abutment is only 1 ft. 6 in. thick, each of the buttresses being the same thickness. Four of these buttresses are carried up to the bridge seat, the other six being of lesser heights, depending on the



Details of Buttressed Abutment.

height of the wing wall. The reinforcement consists of three rails of 40 lb. or 58 lb. weight in each buttress.

Plans have been made and the contract let for a new viaduct over Running Water creek, a short distance out of Chattanooga, which will be 120 ft. high and 1,100 ft. long. The viaduct will be for double track, with ballasted deck, and will require about 2,000 tons of steel.

The improvement work on the Nashville, Chattanooga & St. Louis is handled under the direction of Hunter McDonald, chief engineer; C. H. Johnson, engineer of construction, and R. M. Milan, resident engineer. J. L. Albus is the designing engineer.

THE PUBLIC SERVICE COMMISSION OF WEST VIRGINIA.

The act of the last legislature of West Virginia, creating a public service commission, goes into effect this month; and it is expected that the governor will appoint the commissioners within a week or two. There are to be four commissioners, with salaries of $6,000 each, and the term of service will be eight years. Not more than two shall belong to the same political party and one member must be a lawyer of ten years' experience at the bar. The act applies to all common carriers, telegraph and telephone lines, gas companies, electric light companies, hydro-electric companies, etc. The sections of the law are not so numerous as in those of New York, Missouri and other states, but its framers evidently intended to cover about everything which is included in the longer statutes referred to. Every railroad must permit track connections with industries and with other carriers. Among the powers of regulation of operation, that to require a safe number of men in the crew of a train is specifically mentioned. In the distribution of cars and in making rates, fair treatment must be accorded "tap lines," but nothing out of the main line rate is to be allowed a shipper for the use of "plant facilities."

The commission is to "collect full and complete information" of the value of all the property owned and controlled by a public service commission, once a year, and furnish the same to the Board of Public Works, for use in assessing taxes. A new tax is laid on public service corporations in the shape of a special license fee, the amount of which is to be apportioned to the value of the corporation's property; and the tax, in the aggregate, must produce a revenue of $60,000 a year, which is appropriated for the support of the commission. Any violation of the new law will make the guilty officer, agent, employee or stockholder liable to fine and imprisonment.

THE NEW YORK, WESTCHESTER & BOSTON'S TICKETS.

The New York, Westchester & Boston, running from New York City to White Plains and New Rochelle, now carries about 7,000 passengers a day, and the business is increasing.

Passengers carry their tickets with them into the cars, but the conductors make no collections and the tickets are deposited in a box on leaving the train. This ticket system, long in use in London and other European cities, has proved very satisfactory on the Westchester, and it may now be called a naturalized American institution. By a change, which was adopted on April 1, northbound tickets are made much larger than the southbound.

The passenger purchases a ticket for his destination at the ticket office and passes through a turnstile when he enters the train platform. On reaching his destination he is required to drop his ticket in the collection box in charge of the agent or station "guard," as he passes through the exit-gate. To provide against over-riding, the line of road is divided into zones and a color scheme makes it evident at once whether or not the correct ticket is being dropped in the box. Only one ticket is sold to a passenger and this ticket is good only on the date stamped on its back. A stamp of special construction is used which also cancels the ticket, showing that the passenger has passed through the turnstile to the train. Only two forms of tickets are used, a card local for single trip and a 60-ride monthly commutation form.

In the first issue, when the road was opened, the tickets were of one size, the color designating the zone into which the ticket was valid for passage. It was found, however, that there was some possibility of manipulation under this arrangement and to prevent the misuse of single tickets the two sizes were adopted. A southbound ticket is of the usual size, 2¼ in. x 1¼ in., while northbound tickets are twice that size. Each zone is also designated by two distinct colors, one for southbound and the other for northbound tickets. For example; the color designating the New York zone southbound is red and single tickets for southbound passage to stations in that zone are printed on red cardboard. The color designating New York zone northbound is white, and single tickets for northbound passage to stations in that zone are white.

In a few instances where a given fare carries the passenger over split zones the tickets are printed in two colors. This system is not complicated, and has worked out well. Passengers like it. The daily commuter also, who holds a monthly ticket which is punched when he goes through the turnstile and is shown to the guard at the exit-gate, enjoys the arrangement as the conductor does not interfere with his reading of the newspaper.

The occasional passenger who holds a short ride ticket is quickly noted and is referred to the ticket office at the destination station where he must buy a ticket representing the difference in the amount paid for the ticket which he holds and the amount due the company for the distance which he has ridden.

The distinctive colors used are red, green, gray, pink, blue, white and yellow. It is evident that if in the collection box in which red tickets only are received a white ticket is dropped, it is quickly noticed and the guard calls the passenger's attention to the error.

Ticket agents have hand punches for the purpose of punching season tickets and for emergency use in case the punch in the stamp should get out of order. Each single-trip passenger must buy a ticket each time that he enters the train, tickets not being sold for future use. If a foreign ticket, money or other valuable article should be dropped into a ticket box, the agent drops into the box a memorandum explaining the fact, and then the person who has made the mistake can recover his property when the receiving box is opened. Agents make up a record of ticket sales every two hours. The ticket agent keeps a record in his office of the names of persons who have bought commutation tickets and the dates on which the tickets expire. This record is examined daily.

The New York, Westchester & Boston was opened May 29, 1912. Trains now run through to and from Harlem River on the New York, New Haven & Hartford, so that the lines operated aggregate about 21 miles, and over two hundred trains are run each day. The company has recently made an arrangement with the Adams Express Company for express service over its lines. The passenger trains consist usually of one or two passenger cars; but separate trains are run for express service, leaving the New York and the White Plains termini four times a day.

A large proportion of the passengers on the company's trains pay only five cents fare, this rate being the limit within the city of New York, and also within the city of Mount Vernon. Some of the higher fares have been materially reduced within the past few months, and the round trip rate from New York City to White Plains is now only fifty cents.

The company does a limited freight service, using the station of the New Haven road at the New York terminus and having stations of its own at Wykagyl, Heathcote and White Plains. Freight is moved at night, the tracks being well occupied with passenger traffic in the day time.

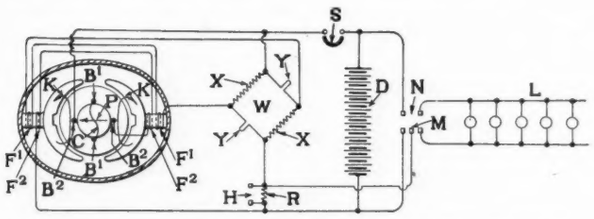
Provision is made in the passenger tariffs for taking ordinary baggage at the express stations and at all of the stations between Mount Vernon and White Plains. Baggage is not carried free and the tickets bear a notation that they are good for the passage of the passenger without baggage. The road is in the main a "commuters'" railroad, and most of the trains consist of one or two passenger cars and nothing more. But the four trains are run for express matter, as above noted, and on these baggage is accepted. The passenger fares are very low and for baggage a charge is made. A large proportion of the passengers pay only five cents for their rides, this being the limit for single fares within the city of New York, and also within the city of Mount Vernon. The minimum charge for 150 lbs. of baggage is ten cents; from Harlem river to Mount Vernon it is 20 cents; and to White Plains, 25 cents.

AXLE LIGHTING SYSTEM.

The Atchison, Topeka & Santa Fe is introducing an axle lighting system, after a test, which has been in process of development by the Electric Storage Battery Company, Philadelphia, Pa., for a number of years. It automatically adjusts the output of the dynamo to the requirements of the service, and gives the battery the slight amount of overcharge required to keep it practically full and in good condition, but no more, producing conditions of operation ideal for maximum battery life. Should the battery become discharged by a prolonged stop with the lamp load on, its charge will be rapidly restored during the subsequent run. Should the car be transferred from a daylight run to one requiring considerable artificial lighting, the output of the dynamo will increase to meet the changed conditions of service. This is all accomplished automatically without manual adjustment of any kind.

The dynamo is of the Rosenberg type, which has been used abroad in axle lighting for a number of years, but has been redesigned to operate in connection with a constant voltage regulator. Current in the primary field winding F^1 produces a small primary field flux represented by the arrow P, which induces a small electromotive force between the short circuited brushes B^1 and a flow of current through the short circuit connection C. This current, flowing through the armature winding, produces by armature reaction the secondary or principal field flux, which does not pass through the frame of the machine, but is confined to the heavy pole shoes and the armature as shown by the arrows K. This latter flux produces the electromotive force at the principal brushes B^2, which are connected to the external circuit, a series field winding F^2 in this circuit serving to balance the armature reaction due to load. An important advantage of this type of machine lies in the fact that it generates the same polarity with either direction of rotation, thus requiring no pole changer.

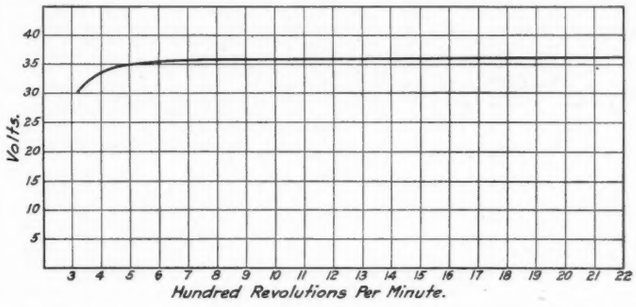
The primary field winding F^1 is connected across opposite



Wiring Diagram for E. S. B. Axle Lighting System.

junction points of the Wheatstone bridge W, the other two junction points being connected respectively to the positive and negative terminals of the machine. This bridge is designed to give the constant voltage characteristics above mentioned. It includes fixed resistances X in opposite branches and iron wire ballasts Y in the other two branches. The latter, on account of their high temperature coefficient, have a practically constant current characteristic under operating conditions. This combination of circuits produces a field excitation continually diminishing with increase of speed. The resulting speed voltage characteristic of the dynamo is shown in one of the illustrations.

An automatic switch S connects the dynamo to the battery D when the voltage of the former is slightly above that of the latter and opens when the output of the dynamo drops to zero. The knife switch N connects the lamp circuit L to the battery.



Speed-Voltage Characteristics of Axle Lighting Dynamo.

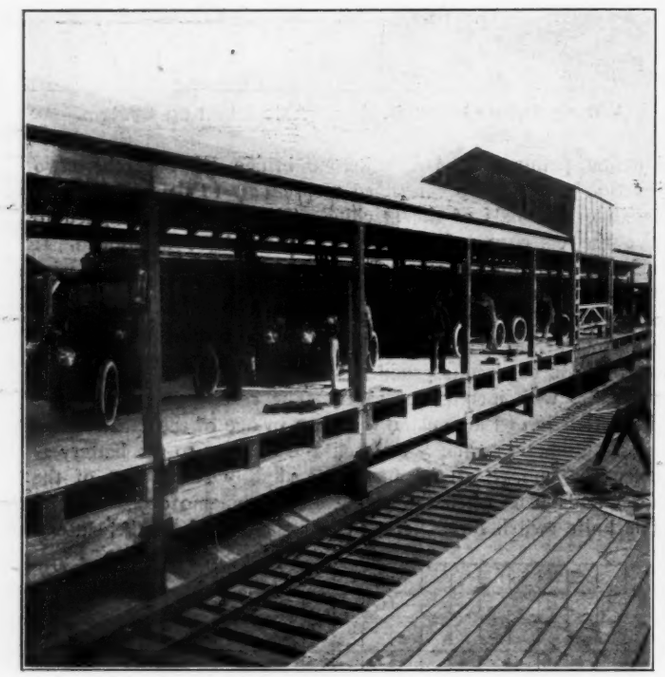
The voltage of the dynamo is fixed at a point slightly above the floating voltage of the cells, thus insuring that the battery is always fully charged. The difference between this voltage and that of the battery on discharge is, however, so small and the change from one to the other so gradual that no lamp regulator is required.

Should it ever be found necessary to give the battery a high voltage charge, this may be done during a daylight run by means of the fixed resistance R, normally short circuited by the switch H and also by the clip M on the main lamp switch. When both of these switches are open, the voltage of the dynamo is raised by an amount determined by the value of the resistance R. Whenever lights are required, the closing of the lamp switch N short circuits the resistance R, reducing the voltage to normal

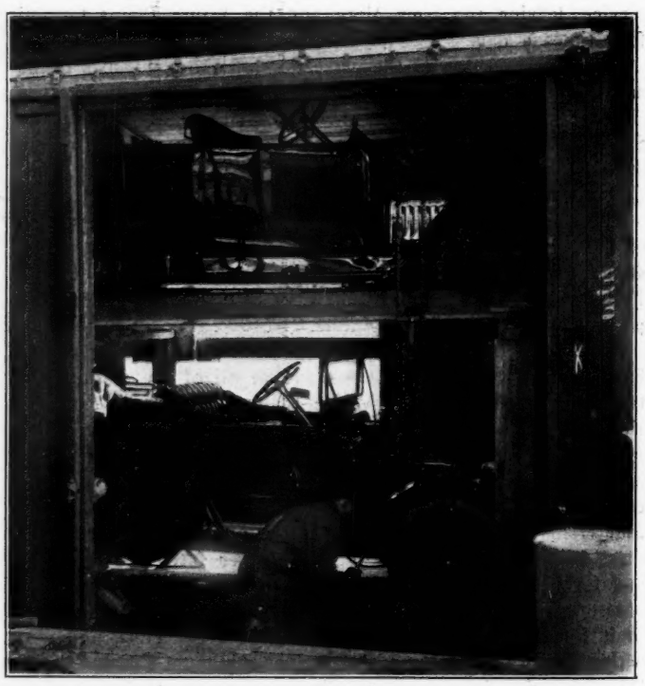
and eliminating the possibility of excessive voltage at the lamps. During five months of continuous operation of a demonstration equipment, no occasion for such a high voltage charge has arisen.

A $50,000 FREIGHT PLATFORM.

The Studebaker Corporation has lately completed at its Detroit factory a loading platform, for shipping automobiles over the Michigan Central, at which 200 freight cars may be loaded in a day, from six to eight automobiles in a car. This structure has been built at an expense of $50,000 to do away with annoying delays which were unavoidable under former conditions. The platform is about 500 ft long, and is roofed over; and there is a track on each side of it. The Michigan Central tracks having been raised to cross above transverse streets, the sidings are also maintained at the upper level, about 20 ft. above the natural surface, and automobiles are raised to the platform on elevators, which take two at a time. The location of one of the elevators is shown in the illustration.



Loading Platform—Studebaker Automobile Works, Detroit.



A "Double-Deck" Load of Automobiles.

The Studebaker Corporation gives us the following notes:

The easy times when the railroads could take the automobile shipments from Detroit by diverting a few furniture cars from Grand Rapids are long since past. All the trunk lines have been forced to invest heavily in special box cars to handle the 300,000 automobiles now shipped from Detroit annually. Solid trains of automobile cars are of frequent occurrence in long hauls. In the spring of 1912, the Detroit manufacturers were forced to store thousands of cars, on account of the overwhelming demand for transportation facilities, and every warehouse in the city was filled. Several factories were forced to use circus tents, and police were called out to quell disturbances caused in the yards when gangs from rival factories fought over box cars.

Formerly, completed automobiles were driven up an inclined plane, under their own power. The new plan boldly abandoned this idea. The automobiles are driven to the elevators, two at a time, and lifted on the elevator to the platform at the level of the floors of the box cars. Loading is carried on day and night by large crews. During the last two months, 200 a day of the Studebaker cars have often been loaded, this in addition to the automobiles shipped from Studebaker's siding in the western part of the city, which connects with the Wabash.

One of the elevators in the new platform connects with the warehouse where parts, advertising literature and miscellaneous shipments are boxed and placed on small trucks. The trucks are elevated to the platform and the goods loaded into cars.

As a track breaks through the platform at one point a rolling bridge, actuated by an electric motor, is used as a movable platform, being run to one side, to clear the tracks, when the switching engine has to place or withdraw cars.

Traffic Manager George Sherman, of the Studebaker Corporation, says that the advantages of the platform, direct and indirect, have been fully up to expectations. "The most helpful feature is the pleasant relation it has cemented with the railroads. They have lost no opportunity to show how they appreciate our efforts toward added freight car efficiency. We have always been able to get freight cars this spring. Sometimes they were not available for the hauls we wanted most, but we seldom ask to have any car diverted from its home route. There is sometimes a tendency for the manufacturer and the railroad to work at cross purposes. We have found that the ideal situation is one in which shipper and the railroads work in harmony, anticipating each other's wants and spending money, when needed, to smooth out the rough spots."

The view showing the interior of a freight car illustrates how automobiles are loaded "double-deck" to economize room on long hauls. From six to eight automobiles, knocked down, are thus loaded into a single car. They are raised to the upper part of the freight car by means of a chain and pulley and then supported by timber framework. The wheels are taken off and packed in racks on the floor. By thus filling a car nearly or quite to its space-capacity the shipper is able in all cases to put in the weight called for by the tariffs.

Railway Construction in the Congo.—A new line which will have an important bearing on the Congo trade is that proposed between Brazzaville, the capital of French Equatorial Africa, on Stanley Pool, and Pointe Norie on the Atlantic seaboard. Sanction for its construction is now being asked and its completion could be effected in eight years. There are now 788 miles of railway open in the Congo.

General News.

The New York State Public Service Commission, first district, has rescinded its order, issued some months since, authorizing the construction of a moving sidewalk beneath Thirty-fourth street, New York City.

The Erie Railroad estimates that full crew laws will cost it $447,180 yearly. The Erie works under such laws in New Jersey, Pennsylvania, Ohio and Indiana, and there will be one in New York after September 1.

A fire in the stock yards of the Michigan Central at Detroit, Mich., on Sunday last destroyed the stock pens, the feed houses and other property, including 250 sheep. Estimated loss $195,000. It is believed that the fire was of incendiary origin.

In the freight yard of the New York Central at Weehawken, N. J., on the evening of May 5, a fire, which is said to have been caused by defective insulation of electric wires, destroyed three lift bridges and a float loaded with freight cars, together with other property aggregating a loss of over $200,000.

Six suits charging violations of the law regulating the transportation of cattle were filed against the Chicago, Rock Island & Pacific at St. Louis last week, together with two suits against the Chicago Great Western, four against the Illinois Central, and one against the Chicago, Burlington & Quincy.

The Minneapolis, St. Paul & Sault Ste. Marie has announced a plan for the organization of a co-operative association among employees, to be open to any who have been in the service of the company for six months or longer, under which employees will be allowed to set aside a portion of their earnings to be invested in securities of the company.

J. D. Farrell, president of the Oregon-Washington Railroad & Navigation Company, has issued a circular including the following: "Absolute freedom of action in political matters is the right of every employee, and the officers, heads of departments and foremen of this company will not attempt to influence the vote or action of any employee in any election."

The Duluth & Iron Range has offered 33 litigants in the White Iron Lake fire case, a lump sum of $24,750 in settlement of their claims for damages sustained in a fire during 1910, for which the railroad was charged with responsibility. The offer was accepted, and it was announced that the attorney representing the litigants will receive $8,250, and the litigants an average of $500 apiece.

The arbitration committee of the Master Car Builders' Association held a meeting at Chicago on April 29 and 30, to consider proposed changes in the code of interchange rules submitted, at the request of the executive committee, by individuals and committees representing the various railway clubs. The final consideration of the rules was postponed to an adjourned meeting on May 8.

The attorney general of Texas, at the request of the railroad commission, has submitted an opinion as to the responsibility of tram or logging roads not incorporated under the railroad incorporation laws, but owned and operated by private individuals or corporations, when they accept freight for transportation. The road is charged with a public use, and therefore is subject to regulation by the commission.

Kansas City Southern passenger train No. 5 was held up early on the morning of May 2 by two men who boarded it as it was leaving the station at Kansas City. The robbers obtained about $1,500 in money and jewels from the passengers. Jesse E. Short, of Joplin, Mo., one of the passengers, exchanged shots with one of the robbers and was dangerously wounded. One robber was also struck by a bullet, but both escaped.

The senate of the Illinois legislature has passed, by a vote of 38 to 6, a bill prohibiting the issuance of passes for transportation within the state, except to persons who would be entitled to free transportation under the provisions of the pass section of the Interstate Commerce law. According to a press report, John G. Drennan, district attorney of the Illinois Central, "startled legislative circles" by announcing that the railways were not opposing the passage of an anti-pass bill by the house.

Railroad officers in St. Louis, following a conference held on Tuesday last, announce that they are going to circulate petitions for a referendum on the Missouri full crew law, which was passed by the last legislature. Under the constitution of Missouri, it is now practicable to secure the suspension of this law until a vote of the people can be taken, in November, 1914, if five per cent. of the voters in eleven congressional districts can be got to sign the petition for a popular vote on the question. The railroads say that the enforcement of the full crew law in that state will cost $700,000 a year.

The Chicago, Rock Island & Pacific, and the Missouri Pacific have granted an increase in wages and a reduction of working time to their shop employees, in an agreement which went into effect on May 1, following conferences with representatives of the shop craft unions. Men who have been working ten hours a day were granted a nine-hour day, and on the Rock Island were given an increase of two cents an hour. On the Missouri Pacific the increase is 1½ cents an hour. Boilermakers, machinists, blacksmiths, sheet metal workers, carmen, painters and their helpers are affected. Negotiations for an increase for the shop men employed on the Kansas City Southern and the Missouri, Kansas & Texas are pending.

Congressman Broussard of Louisiana has introduced in the House a bill designed to perpetuate and improve the commerce court. The bill proposes to give the court power to review orders of the Interstate Commerce Commission, both negative and affirmative, so that a shipper will have the same facility of appealing to the court as do the carriers at present. It is proposed that three judges of the court shall constitute a quorum and that appeals from the courts of Porto Rico, the Philippine Islands and the Canal Zone shall go to the commerce court instead of directly to the supreme court of the United States. Changes are proposed in the procedure before the court in cases where the government is the defendant.

The board of management of the Intercolonial Railway of Canada is to be dissolved forthwith, and the management of the road placed in the hands of a single commissioner, F. P. Gutelius. David Pottinger, the veteran manager at Moncton, will retire on full superannuation. The other members are A. W. Campbell, chairman; F. P. Brady (general superintendent); E. Tiffin (traffic manager); and J. B. T. Caron (general solicitor). Mr. Campbell is the deputy minister of railways and canals, and as such will continue his work at Ottawa. Mr. Gutelius was formerly superintendent of the Canadian Pacific, at Montreal, but for the past year has been engaged in an investigation of the construction of the Trancontinental Railway.

The treasurer of Polk county, Iowa, has made a demand on the Chicago, Rock Island & Pacific Railroad, an Iowa corporation, for alleged unpaid taxes for five years, together with interest at 6 per cent., aggregating $15,559,440. This demand was authorized by the county board of supervisors, who also entered into a contract with the law firm of Kistle & Wright, of Council Bluffs, to bring suit in the district court against the corporation to enforce the collection of the money. According to the contract the attorneys will receive 40 per cent. of all the money they collect. The matter was brought before the board of supervisors by the two attorneys, who appeared unexpectedly at a meeting of the board and stated that after a year's work they had secured sufficient facts and figures to show that the company had withheld from taxation property worth $160,000,000. They asked for authority to institute proceedings against the company, and submitted a contract allowing them 50 per cent. as a fee. This was finally reduced to 40 per cent. A member of the board of supervisors is quoted as saying that the board has no proof whatever that the company has failed to schedule its property.

New York Workmen's Compensation Law.

The legislature of New York, which adjourned last week, passed a law providing for the payment of compensation for injuries to workmen in the principal industries. An employer will have a choice of four methods of providing for his employees in case of accident; by a state insurance fund to which he would contribute; by insurance in casualty companies; by

joining a mutual employers' insurance company; and by assuming the liability himself, provided he gives to the state insurance department satisfactory evidence of his financial ability. The law is in some respects like that of New Jersey, but the percentage of wages used in calculating the basis of compensation is 60 per cent. As in New Jersey, an employer who does not take action under the law is deprived of the usual defenses when sued under the common law by an injured employee. Casualty insurance men in New York City estimate that at present employers in New York State pay out annually $15,000,000 either for insurance premiums or in the shape of payments in cases which are settled under the common law; and it is believed that under the new law they will expend more than three times the sum named.

A Ten Dollar Suit in the Supreme Court.

The Missouri, Kansas & Texas Railway of Texas has appealed to the Supreme Court of the United States in a suit brought against it by L. C. Cade, a track repair laborer, the question at issue being a statute of Texas which allows attorney's fees on claims for labor which are not paid within thirty days. In Cade's case, a claim for $10, the attorney's fees amounted to about $9, whereas the costs of the court were only 50 cents. The case comes direct from the court of the Justice of Peace in Oak Cliff, Dallas county. The railroad fare of one attorney from Dallas to Washington is over $40.

The railroad company contested Cade's claim, first on the ground that it did not owe the money and second on the ground that the provision for attorney's fees conflicted with Article 14 of the federal constitution. Appeal was taken direct to the United States Supreme Court, for the reason that for cases of this kind there is no appeal in the state courts from the decision of the Justice's Court. The grounds of unconstitutionality under the federal constitution made it possible to appeal to the highest court of the land.

The Western Union on the L. & N.

The latest phase of the litigation between the Louisville & Nashville and the Western Union, which has followed the action of the L. & N. in 1911, in ordering the telegraph company to vacate its right of way, is a suit begun by the road against the Western Union in the Circuit Court at Knoxville, Tenn., demanding $600,000 as compensation. The judgment is sought for rental of the right-of-way. For forty years the Western Union leased pole and wire privileges from the Louisville & Nashville. In August, 1911, the road notified the Western Union that it would have to remove its lines at the expiration of the lease, and gave 3½ months in which to remove poles and wires. This was not done and the railroad has now brought the suit for $600,000. This is estimated as rental at the rate of $100 per mile for 4,521 miles, with a charge for renting wires to the Southern Bell Telephone Company. The alleged telephone arrangement is declared to have been entered into surreptitiously. The sum named includes also additional charges for railway stations in which Western Union operators are located. In some states through which the L. & N. extends it is provided by statute that when a tenant holds on after expiration of a lease he is liable for double the rental value. All these considerations, the railroad claims, bring the amount for which judgment should be rendered up to $600,000.

Investigation of the New Haven Road.

Commissioner Prouty continued through last week his hearings in Boston, held for the purpose of giving critics of the New York, New Haven & Hartford a chance to publicly study the statements which the commission has made up from the company's records of the past ten years, and this week, beginning on Wednesday, held another hearing at Washington. At Boston the purchasing agent of the road was questioned about contracts for coal and for cars. On Thursday President Mellen made a statement, taking about three hours, but he was not put under oath. He said that items on the records showing an apparent profit to himself in transfers of stock represented payments, approved by the directors, made by him to political campaign funds, notably $50,000 to the Republican presidential campaign in 1904. To the charge that John L. Billard made excessive profit in connection with the acquisition of the Boston & Maine, Mr. Mellen replied that Billard's transactions were not yet closed. The purchase of the New York, Westchester & Boston was decided on by others than Mr. Mellen; he, personally, was not in favor of it. He was in favor of selling steamers to C. W. Morse, but was overruled. Critics claimed that the recent sale of the company's parlor and sleeping cars to the Pullman Company was a bad bargain, but Mr. Mellen gave figures to show that it was a good one.

American and German Practices Compared.

In the discussion of Professor Cunningham's paper before the New York Railroad Club, April 18 (*Railway Age Gazette*, April 25), Arthur M. Waitt, formerly chief mechanical officer of the Lake Shore and the New York Central, declared that most of the large railways in the United States are under-officered; and that detail work is not adequately supervised. Too much detail is imposed on the heads of departments, and they are left with insufficient time for getting into close touch with the territories they manage. Mr. Waitt's observations cover 25 years' service on American roads, and 10 years since, in which he has been free from any direct alliance with them—this 10 years embracing many visits to Germany. He makes no question that in this country an insufficient force is provided to collect and collate data and to make comparisons and analysis of the results of management. Complaints and special inquiries from railroad and government officials require unusual efforts and expenditure of time to the detriment of other necessary and important routine work. There is a tendency also for higher supervising and administrative officers to interfere in matters for which they are not technically trained.

"In recent years heads of departments are too frequently made to be mere puppets, trained to jump when the strings are pulled, and they are not given that sense of personal responsibility and authority which develops strong and reliable men. This unfortunate condition is passed down the line and results in a weak organization.

"One noticeable feature to the discredit of our American railways is seen in the general character of the passenger stations in this country as compared with those in Germany. In nearly all of the large cities in Germany the railway stations are models of neatness, comfort and convenience, and even the stations at small towns and villages are neat, well constructed and ornamental to their surroundings. In fairness it must be said that in this country we have a few of the finest examples in the designs of railway stations to be found in the world. But unhappily these notable examples are the exception rather than the rule.

"A more generally satisfactory passenger service would be given in this country by the gradual introduction of classified passenger service not only in standard railway service but also in the subway and elevated service in our large cities, where the conditions of mixed classes is at frequent times almost unbearable. In America we compel the man with the small wages to accept and pay for the higher class of accommodations and furnishings that are demanded by those of more ample means. As a result the poor man feels, justly, that he is overcharged and the well-to-do man or woman feels indignant at being compelled to submit to the unsatisfactory conditions."

The Useless Railroad Valuation.

The act of Congress requiring the Interstate Commerce Commission to make a valuation of railroad property takes effect on May 1, and the leading railroad officials of the country have appointed a committee of eighteen, to devise a mode of procedure for the companies in doing their part. Five years is the time estimated as necessary for this investigation, and the cost has been estimated at $6,000,000, but that must be the cost to the government, and it will entail a great deal of expense to the railroads. That oppressed beast of burden, "the public," for whose benefit the work is supposed to be done, will have in the end to pay the entire bill and will find the benefit to be naught. It requires little imagination to form an idea of this "job," which will give extra employment to many, and entail corresponding expense, in the service of both the government and the railroads. A multitude of details about organization and financing issues of securities, expenses, gross and net earnings, etc., are to be ascertained. Many of the "elements" and factors which are to be sought for will be impossible of ascertainment, because

records have disappeared and no account of them has been kept. As to "other elements of value," what are they? There is value for a railroad in its advantages of location, the development of the country through which it passes, the enterprise and ability of its management, the "good will" of a successful business. Are these things to be ascertained and set down for all common carriers subject to the Interstate Commerce act, with "an analysis of the methods of valuation employed and of the reasons for any differences between such value and each of the foregoing cost or present value"? If not, what is the use in requiring them to be ascertained and reported separately, with such analysis?

But suppose this herculean task to be accomplished, and suppose the result to represent a reasonable approximation to accuracy, what then? The statistics and statements would be imposing and bewildering in volume and magnitude, but would they be worth all the trouble and cost? Of what use would they be to the government? There would be no end of variations and differences in the ratio of capital to value, and much depends upon what the values were and are which are properly to be represented in capitalization. Every expert student of the subject knows that for the purpose of fixing of rates the volumes of the commission's report would be utterly useless. Other factors determining the charges which railroads are entitled to make for their service would so far outweigh anything that could be deduced from this mass of material that no account could be made of it. It would be a monument of wasted effort.—*Journal of Commerce (New York).*

Waiting at the Window.

It frequently happens that just when a ticket agent is busily engaged totaling up a report or doing some other important work that cannot well be interrupted for the moment a patron comes to the window. If he is not recognized at once, he becomes impatient and proceeds to get irritated. A pleasant word from the agent will often set the party at ease and retain his good will, while silence on the part of the agent may result in a loss of business, later if not then. Everybody dislikes being unnoticed. A smile and a cheery word always wins.—*Louisville & Nashville Passenger Bulletin.*

Air Brake Association Exhibits.

Following is a list of the exhibitors at the annual meeting of the Air Brake Association, which is now in session at St. Louis, Mo. The proceedings for the Tuesday and Wednesday meetings are reported on page 1033 of this issue.

Adreon Manufacturing Company, St. Louis, Mo.—Security angle cock holders and Security back-up valve. Represented by D. R. Niederlander, E. L. Adreon, Jr., and Wm. A. Vincent, Jr.

American Air Brake Company, St. Louis, Mo.—Automatic slack adjuster, "American" locomotive driver brake, and "American" locomotive truck brake. Represented by the Westinghouse representatives.

American Brake Company, Chicago.

American Piston Company, Indianapolis, Ind.—Piston rod packing, air pump packing and cab valve packing. Represented by V. D. Morrison and A. H. Schlaegel.

American Steel Foundries and the Simplex Railway Appliances Company, Chicago.—Ajax, Hercules and Vulcan brake beams. Represented by W. E. Fowler, Jr.

Ashton Valve Company, Boston.—Duplex and triplex gages, inspector's test gages, rear end protected dial gages, locomotive steam gages, dead weight tester, inspector's boiler test pump, air pump piston swabs, wheel press recording gages and locomotive safety valves. Represented by J. F. Gettrust.

Canadian Westinghouse Air Brake Company, Hamilton, Ont.—Represented by A. B. Brown and J. H. Reed.

Crandall Packing Company, Palmyra, N. Y.—Packings. Represented by F. E. Ransley.

Crane Company, Chicago.—Valves and air brake fittings. Represented by G. S. Turner.

Detroit Lubricator Company, Detroit, Mich.—Detroit locomotive lubricators. Represented by A. D. Homard.

Joseph Dixon Crucible Company, Jersey City, N. J.—Air brake graphite grease, air brake graphite, etc. Represented by L. H. Snyder.

Emery Pneumatic Lubricator Company, St. Louis, Mo.—Emery brake cylinder lubricant, Emery pneumatic lubricator. Represented by E. A. Emery and G. L. Janis.

Garlock Packing Company, Palmyra, N. Y.—Air pump packing. Represented by Philip Arnold, J. E. Hillerman and H. J. Ramshaw.

Gold Car Heating Company, New York.—Steam couplers, filling valve, and non-return check valve. Represented by Mr. Ivers.

Greene Tweed & Company, New York.—Palmetto packings. Represented by L. J. Van De Wall.

H. W. Johns-Manville Company, New York.—J. M. air brake expander rings, J. M. flexible metallic hose gaskets, and packings. Represented by J. E. Meek, J. Trent, G. Christianson, C. Murphy and J. C. Jacobs.

The Leslie Company, Lyndhurst, N. J.—Steam hose regulator. Represented by S. I. Leslie and J. J. Cizek.

McQuay-Norris Manufacturing Company, St. Louis, Mo.—"Leak-Proof" piston rings. Represented by W. K. Norris, E. H. Hill and F. J. Goedeike.

Marvin Manufacturing Company, Franklin, Pa.—Air brake compound, antifriction triple valve oil. Represented by T. G. Averill.

Nathan Manufacturing Company, New York.—Bullseye lubricator, Simplex and Monitor injectors. Represented by Otto Best and J. S. Seeley.

New York Air Brake Company.—Represented by Mr. LaQuade.

New York & New Jersey Lubricant Company, New York.—Non-fluid oil and air brake lubricant. Represented by J. H. Bennis.

Pyle National Electric Headlight Company, Chicago.—Model of type E turbo generator and lamp. Represented by C. P. McGinnis.

Standard Heat & Ventilation Company, New York.—Full line of steam heat equipment, including starting valves, regulator valves, train line valves, steam hose couplers, steam gages and car ventilators. Represented by Beorge B. Culver.

United States Metallic Packing Company, Philadelphia, Pa.—King (type U. S.) air pump packing. Represented by M. B. Brewster and C. L. Mellor.

Westinghouse Air Brake Company, Pittsburgh, Pa.—Literature and chart racks. Represented by E. L. Adreon, R. E. Adreon, S. J. Kidder, F. M. Nellis, C. P. Cass, C. W. Townsend, C. H. Beck, F. B. Johnson, F. B. Farmer, H. H. Burns, S. H. Mills, A. Hartenstein, L. B. Wilcox, W. M. Sleet, E. H. Dewson, W. V. Turner, J .Wright, A. L. Berghane, R. Cunningham, J. Hume and D. M. Lewis.

Guilford S. Wood, Chicago.—Nipple end hose protector, Monogram angle cock holder and Sheafe coupler.

International Railway Fuel Association.

The fifth annual convention of the International Railway Fuel Association will be held at the Hotel Sherman, Chicago, May 21-24. On Wednesday, May 21, after addresses by the president and by R. H. Ashton, vice-president of the Chicago & North Western, and Francis S. Peabody, president of the Peabody Coal Company, there will be a paper on Standard Form of Contract Covering Purchase of Railway Fuel Coal, and one on Sub-Bituminous and Lignite Coal as Locomotive Fuel, which will be followed by discussions.

On May 22 there will be a paper and a discussion on Location, Construction, Development and Operation of a Bituminous Coal Mine, and the Report of Standing Committee on Firing Practice.

On May 23 there will be a paper and a discussion on Self-Propelled Railway Passenger Cars, and on Modern Locomotive Coaling Station: Its Design, Construction, Operation and Maintenance.

On May 24 there will be a paper, followed by a discussion on Scaling of Locomotive Boilers and Resultant Fuel Loss, the report of standing committee on Constitution and By-Laws, report of special committees, election of officers and the report of the executive committee on Selection of Subjects Presented at the Current Meeting for Discussion, with Recommendation on Subjects for Future Presentation.

A record attendance at the convention is expected, as 135 new members have been added since the convention in 1912.

Railway Storekeepers' Association.

The tenth annual convention of the Railway Storekeepers' Association will be held at the Hotel Sherman, Chicago, May 19-21. The subjects of the papers to be presented include: Reducing Inactive and Disposing of Obsolete Stock; Rolling Mills at Railroad Scrap Docks; What Effect, if Any, Has a Well Organized Stores Department on the Operating Cost of a Railroad?; Specifications for and Testing Materials and Effect on Storekeeper's Stock; Ice, Proper Method of Storage, Disbursement, Shrinkage and General Handling on Railroads; Standard Store House; Standard Stationery Store House; Standard Supply Car; Standard Scrap Dock and Reclaiming Machinery. Reports will be received from the committee on Recommended Practices, the committee on Accounting, the committee on Piece Work, the committee on Standardization of Tinware, the committee on Stationery, the committee on Uniform Grading and Inspection of Lumber, the committee on Scrap Classification, and the committee on Membership. A special committee has been appointed to prepare and submit for adoption a book of Standard Rules Governing Store Department Practices.

Convention Special to Atlantic City.

Following its usual custom for the accommodation of delegates to the conventions of the Master Mechanics' and Master Car Builders' associations at Atlantic City, the Pennsylvania Lines will provide a special train, to be known as the "Master Mechanics' Special" leaving Chicago at 3 p. m. on Monday, June 9, and reaching Atlantic City about 2 o'clock the following

afternoon. The summer tourist fare from Chicago to Atlantic City, good to return within 30 days, will be $29.25 for the round trip.

Trade Press Convention.

The eighth annual convention of the Federation of Trade Press Associations will be held at Hotel Astor, New York, September 18-20. William H. Ukers, editor of the *Tea and Coffee Trade Journal*, has been made chairman of the committee on arrangements and is preparing a program which will provide papers and addresses on topics of interest to manufacturers, sales managers and advertising men, as well as to the trade paper editors and publishers. Two sessions will be held daily. There will be editorial, circulation, advertising and publishing symposiums.

American Society of Mechanical Engineers.

The Spring meeting of the American Society of Mechanical Engineers will be held in Baltimore, Md., May 20-23, at the invitation of the Engineers' Club of Baltimore and local members of the society. A bulletin has just been issued giving the program for the meeting and information regarding hotel accommodations and transportation.

Central Railway Club.

At the next regular meeting of the Central Railway Club, to be held at the Hotel Statler, Buffalo, N. Y., May 9, B. H. Mann of St. Louis, signal engineer of the Missouri Pacific and president of the Railway Signal Association, will present a paper dealing with the Signal Department on Railroads.

Third International Congress of Refrigeration.

The finance committee of the American Association of Refrigeration is charged with the duty of raising a guarantee fund of $100,000 for the Third International Congress of Refrigeration, to be held in Chicago in September, 1913. Contributions are asked from all companies interested.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass. Convention, May 20, Chicago.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Annual meeting, June 17-20, Buffalo, N. Y.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, St. Louis, Mo.; 3d Friday of March and September.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York. Next meeting, May 21, New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, October 21-24, 1913, Montreal.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, 900 S. Michigan Ave., Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 11-13, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—A. R. Davis, Central of Georgia, Macon, Ga.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.; annual, June, 1913.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wenlinger, 11 Broadway, New York; 2d Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Next convention, January 20-22, 1914, New Orleans, La.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago. Annual meeting, May 28, Atlantic City, N. J.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago. Next meeting, May, 1913, Baltimore, Md.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago. Semi-annual meeting, June, 1913, Atlantic City, N. J.; annual convention, October 18-24, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 112 West Adams St., Chicago; annual, May 20, 1913, St. Louis, Mo.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York.

ASSOCIATION OF WATER LINE ACCOUNTING OFFICERS.—W. R. Evans, Chamber of Commerce, Buffalo, N. Y. Annual meeting, October 8, Philadelphia, Pa.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—H. A. Neally, Joseph Dixon Crucible Co., Jersey City, N. J. Meeting with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursday, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, Oliver building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va. Next convention, June 18, Bluff Point, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, 11, rue de Louvain, Brussels, Belgium. Convention, 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—C. G. Hall, 922 McCormick building, Chicago. Annual meeting, May 21-24, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—Wm. Hall, 829 West Broadway, Winona, Minn. Next convention, July 15-18, Chicago.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Annual meeting, August 18, Richmond, Va.

MAINTENANCE OF WAY & MASTER PAINTERS' ASSOCIATION OF THE UNITED STATES AND CANADA.—W. G. Wilson, Lehigh Valley, Easton, Pa.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 26-29, 1913, Chicago.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 16-18, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Annual meeting, September 9-12, Ottawa, Can.

NATIONAL RAILWAY APPLIANCE ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILROAD CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.

PEORIA ASSOCIATION OF RAILROAD OFFICERS.—M. W. Rotchford, Union Station, Peoria, Ill.; 2d Thursday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxom, 2 Rector St., New York. Annual dinner, second week in December, 1913, New York.

RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.

RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo. Next meeting, August 12-15, Nashville, Tenn.

RAILWAY DEVELOPMENT ASSOCIATION.—W. Nicholson, Kansas City Southern, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Meetings, Wednesday and Thursday, June 11-12, New York; convention, October 14, Nashville, Tenn.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Annual convention, May 19-21, Chicago.

RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. Assocs.

RAILWAY TEL. AND TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Sups.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling, Ill. Convention, September 8-12, 1913, Chicago.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRACK SUPPLY ASSOCIATION.—W. C. Kidd, Ramapo Iron Works, Hillsburn, N. Y. Meeting with Roadmasters' and Maintenance of Way Association.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAFFIC CLUB OF ST. LOUIS.—A. F. Versen, Mercantile Library building, St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago. Annual meeting, June 17, Los Angeles, Cal.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y. Annual meeting, August, 1913, Chicago.

UTAH SOCIETY OF ENGINEERS.—R. B. Ketchum, University of Utah, Salt Lake City, Utah; 3d Friday of each month, except July and August.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock block, Chicago; 1st Monday in month, except July and August, Chicago.

Traffic News.

The Sunset Central Lines, International & Great Northern, Texas & Pacific, and St. Louis, Iron Mountain & Southern have announced that they will allow rates of one cent a mile for the reunion of the Confederate Veterans at Chattanooga, Tenn. The roads originally declined to make rates lower than two cents a mile.

Two hundred and fifty fruit growers of Arkansas held a meeting last week and appointed a committee to protest against the new demurrage rules of the Arkansas Railway Commission. One of the rules passed gives the railways authority to store shipments at the expense of the owners after a demurrage charge of $13 has accumulated against a car.

The Long Island Express Company will on June 1 go out of business, the Long Island Railroad having made a contract with the Adams Express Company to do the express business on the company's lines. The growth of Long Island has created a demand for through express rates and facilities which can be furnished much better by a large company; and the large number of offices maintained by the Adams in New York City will enable that company greatly to improve the local service.

Car Balance and Performance.

Arthur Hale, chairman of the committee on relations between railroads of the American Railway Association, in presenting statistical bulletin No. 144, covering car balances and performances for January, 1913, says:

The miles per car per day for January decreased .1 points to 24.3, compared with December, 1912, but increased 3.9 points over January, 1912, which were 20.4.

Ton miles per car per day were 392, compared with 396 for December. This is an increase of 20.62 per cent. over the figure for January, 1912, which was 325.

The proportion of home cars on line was 51 per cent., compared with 48 per cent. in December, 1912, and 58 per cent. for January, 1912.

There is a decrease of 1.8 points to 68.5 per cent. in the percentage of loaded car mileage compared with December, 1912. The per cent. of loaded car mileage for January, 1912, was 69.2 per cent.

The average earnings per car per day of all cars on line were $2.45, compared with $2.61 in December, 1912. This is an increase of 12.90 per cent. over the earnings for January, 1912, which were $2.17.

The table on the next page gives car balance and performance in the month covered by the report, and the diagram shows car earnings and car mileage and different car performance figures monthly from July, 1907.

INTERSTATE COMMERCE COMMISSION.

Cottonseed Rate Reduced.

Louisville Cotton Seed Products Company v. Louisville & Nashville et al. Opinion by the commission:

The rate charged by the defendants for the transportation of cottonseed in carloads from Memphis, Tenn., to Louisville, Ky., was found to be unjustly discriminatory to the extent that it exceeds the rate on cottonseed oil. (26 I. C. C., 607.)

Refrigeration Charges Increased.

In re investigation and suspension of advances in refrigeration charges between points located on the Kansas City Southern Railway; the Arkansas Western Railway; and the Texarkana & Fort Smith Railway, and to and from points on connecting lines. Opinion by Commissioner Clements:

Under a rule in trans-Missouri circular 1-B the carriers absorb icing charges on perishable commodities when 10,000 lbs. are offered upon payment of less-than-carload rate. The Kansas City Southern proposes in its individual tariff under suspension to withdraw from participation in that rule, which action will increase charges via its line to the basis of the carload rate as freight plus a separate charge for refrigeration. The commission decided that the proposed action was justified and the order of suspension was vacated. (26 I. C. C., 617.)

Rates on Rough Plow Handles Reduced.

G. A. Kelly Plow Company v. Texas & Pacific et al. Opinion by the commission:

The commission decided that the defendants' rates on rough plow handles from Fort Smith, Ark., to Longview, Tex., were unjust and unreasonable to the extent that they exceed by more than 3 cents per 100 lbs. the rates on hardwood lumber, and prescribed those rates for the future. Reparation was awarded. (26 I. C. C., 581.)

Rates on Asphalt and Asphaltum.

In re investigation and suspension of advance in rate by carriers for the transportation of asphalt and asphaltum, from points in Kansas to St. Louis, Mo., and other points. Opinion by Commissioner Clements:

The commission decided that the proposed advances in rates on asphalt and asphaltum from points in Kansas to St. Louis, Mo., and other points had not been justified and ordered the carriers to cancel the suspended tariffs. (26 I. C. C., 614.)

Rates on Sand to Houston, Tex.

In re investigation and suspension of advances in rates by carriers for the transportation of sand and gravel from points in the state of Louisiana to Texas points. Opinion by Commissioner Harlan:

The commission decided that the increased rates on sand and gravel from Anchorage, La., to Houston and Beaumont, Tex., and from Kinder, La., to Houston were not unreasonable, but the rate from Kinder to Beaumont was excessive. The order of suspension was vacated, but the defendants were directed to establish a reasonable rate from Kinder to Houston. (26 I. C. C., 677.)

Rates on Steel Window Sash Reduced.

Goldfield Consolidated Milling & Transportation Company v. Chicago & Erie et al. Opinion by the commission:

The commission decided that the charges for the transportation of a carload of steel window sash from Youngstown, Ohio, to Goldfield, Nev., at a combination through rate based on Sacramento, Cal., were unreasonable to the extent that the portion of the through rate from Sacramento to Goldfield exceeded the rate contemporaneously in effect from and to the same points on wooden window sash in carloads and prescribed that rate for the future. Reparation was awarded. (26 I. C. C., 605.)

Ground Iron Ore Rates Increased.

In re advances on ground iron ore from points in Alabama, Georgia, and Tennessee to Boston, New York, Philadelphia, and other points. Opinion by Commissioner Marble:

The commission decided that the withdrawal of commodity rates on ground iron ore in carloads from certain Alabama, Georgia, and Tennessee points other than Chattanooga to the north Atlantic ports, leaving in effect higher class rates, was justified, but that the proposed advance in the all-rail and rail-and-water rates on ground iron ore in carloads from Chattanooga to New York and Boston was not justified. An order was entered in accordance with this decision. (26 I. C. C., 675.)

Attempt to Close Route Frustrated.

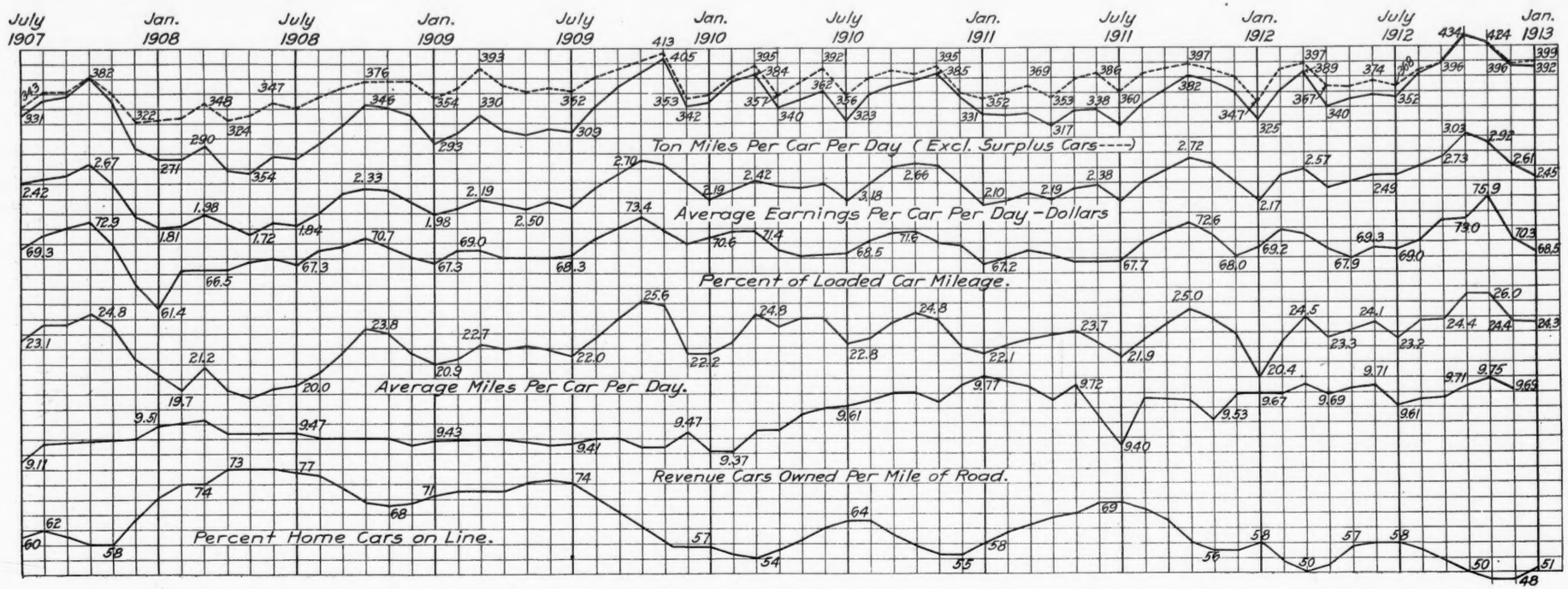
Southwestern Missouri Millers' Club v. St. Louis & San Francisco et al. Opinion by Commissioner Prouty:

Millers at Springfield, Mo., and at various other points upon the St. Louis & San Francisco between Springfield and Bridge Junction, Ark., obtain their wheat west of Springfield, grind it in transit, and ship the product, among other distributions, to points on the Rock Island road between Bridge Junction and Little Rock, Ark. In the past rates from this originating territory to all points between Wister, Okla., and Bridge Junction have been the same and have applied either via Wister or via Bridge Junction. Upon the expressed intention of the defendants to close the route via Bridge Junction, the commission decided that the Bridge Junction route should be maintained with respect to the territory involved, except that lying south of Monett, Mo.; that is, from all territory which can be reached at practically the

CAR BALANCE AND PERFORMANCE IN JANUARY, 1913.

	New England.	N. Y., N. J., Del., Md., Eastern Pa.	Ohio, Ind., Mich., Western Pa.	Va., W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minn.	Mont., Wyo., Neb., Dakotas.	Kan., Colo., Okla., Mo., Ark.	Texas, La., New Mex.	Ore., Idaho, Nev., Cal., Ariz.	Canadian Lines.	Grand Total.
Revenue freight cars owned	87,241	682,100	222,580	188,877	128,083	419,370	17,349	130,789	19,874	133,802	131,366	2,161,431
Average number of system cars on line	40,117	330,101	103,090	89,367	45,241	261,434	4,098	58,276	14,443	58,737	88,104	1,093,008
Railway-owned cars: Average foreign on line	60,514	322,025	118,814	83,526	66,469	164,432	11,613	72,559	27,524	58,411	60,871	1,046,758
Total Railway-owned cars on line	100,631	652,126	221,904	172,893	111,710	425,866	15,711	130,835	41,967	117,148	148,975	2,139,766
Excess	13,390	*29,974	*676	*15,984	*16,373	6,496	*1,638	46	22,093	*16,654	17,609	*21,665
Per cent. of cars on line to total owned:												
Home	46	48	47	48	35	63	24	45	73	44	67	51
Foreign	69	47	53	44	52	39	67	50	138	44	46	48
All railways	115	95	100	92	87	102	91	95	211	88	113	99
Private cars on line	4,158	40,275	11,224	6,268	7,369	14,795	1,351	7,641	2,642	14,069	3,409	113,201
Total, all cars on line	104,789	692,401	233,128	179,161	119,079	440,661	17,062	138,476	44,609	131,217	152,384	2,252,967
Per cent. of cars in shop	6.83	5.62	8.17	5.90	13.69	5.68	7.17	6.50	6.50	4.56	5.09	6.49
No. of freight engines owned	1,405	10,314	3,127	3,457	2,265	6,912	546	2,682	678	2,787	2,143	36,316
Average cars on line per freight engine owned	75	67	75	52	53	64	31	52	66	47	71	62
Total freight-car mileage	57,959,927	545,700,746	162,301,071	144,962,037	96,247,058	305,980,882	23,604,017	89,511,135	30,848,464	115,735,360	106,070,064	1,678,920,761
Average mileage per car per day	17.8	25.4	22.2	26.1	26.2	22.9	45.8	22.0	22.4	28.3	22.4	24.3
Per cent. loaded mileage	71.4	64.9	68.2	66.9	74.0	69.1	76.5	71.0	63.1	70.8	75.6	68.5
Ton-miles of freight, including company freight	683,859,412	9,163,267,957	2,695,356,428	2,421,271,909	1,544,991,460	3,849,157,033	415,975,525	1,372,983,595	382,538,449	1,680,115,608	1,783,166,972	25,992,684,348
Average ton-miles, including company freight:												
Per car-mile	11.8	16.8	17.4	16.7	16.2	15.7	18.1	15.3	12.4	14.8	16.9	16.2
Per loaded car-mile	16.5	25.9	25.6	25.0	22.0	22.3	23.6	21.6	19.7	21.3	22.3	23.6
Per car per day	211	427	387	436	425	359	830	338	279	420	379	392
Gross freight earnings	$7,162,717	$50,115,412	$14,379,040	$13,689,521	$9,205,091	$31,570,203	$2,698,634	$11,463,295	$3,536,093	$16,422,323	$10,491,203	$170,733,532
Average daily earnings: Per car owned	$2.65	$2.38	$2.08	$2.34	$2.32	$2.43	$5.02	$2.73	$5.74	$3.98	$2.59	$2.55
Per railroad car on line	2.30	2.48	2.09	2.55	2.66	2.39	5.54	2.87	2.72	4.54	2.28	2.58
All cars on line	2.20	2.34	1.99	2.47	2.49	2.31	5.10	2.72	2.56	4.06	2.23	2.45

*Denotes deficiency.



Freight Car Mileage, Earnings and Performance, 1907 to 1913.

same length of haul through Bridge Junction as through Wister. No order was made but the decision will be regarded as an order. (26 I. C. C., 630.)

Reparation Awarded.

West Virginia Rail Company v. Baltimore & Ohio et al. Opinion by the commission:

Part of the traffic involved moves from points of origin in West Virginia to destinations in the same state, passing in transit about 1,500 ft. through the state of Kentucky. The commission decided that this traffic is subject to the act to regulate commerce, and that the rates for the transportation of steel rails in carloads from Huntington, W. Va., to points on the Norfolk & Western in West Virginia and Virginia were unreasonable. Reasonable rates were prescribed for the future. (26 I. C. C., 622.)

Relief from Fourth Section Denied.

Janesville Clothing Company v. Chicago & North Western et al. Opinion by the commission:

The complainant attacks as unreasonable and unjustly discriminatory the defendants' rates for the transportation of cotton piece goods from various southern producing points to Janesville, Wis., as compared with the lower rates to Madison, Wis., to which Janesville is intermediate. The commission decided that the complainant is not shown to have been damaged by a violation of sections 1, 2, or 3 of the act, as alleged. The petition was dismissed. The maintenance of lower rates for the transportation of cotton piece goods from southern producing points to Madison, Wis., than to Janesville, Wis., the intermediate point, was not justified by the carriers, and relief from the provisions of the fourth section of the act was denied. (26 I. C. C., 628.)

Joint Rates on Coal Established.

Sheridan Chamber of Commerce v. Chicago, Burlington & Quincy et al. Opinion by Commissioner Meyer:

Complaint was made of the rates on coal from Sheridan, Wyo., to points in Nebraska and South Dakota on the line of the Chicago & North Western and the Chicago, Milwaukee & St. Paul, and to points east and west of Billings, Mont., on the line of the Northern Pacific. Comparisons are made of distances and rates from Sheridan, Hudson, and from Illinois and Indiana coal fields to points of destination on the Chicago & North Western herein involved. Similar comparisons are made of distances and rates from Sheridan, Roundup, Mont., and from Illinois coal fields to points of destination on the Chicago, Milwaukee & St. Paul herein involved. Sheridan mines are at a disadvantage of from 85 cents to $1 in competing at points on the Northern Pacific with the mines located on that railroad. The commission decided that the great discrepancy between the rates from Sheridan and from Hudson to the same points of destination on the Chicago & North Western and between rates from Sheridan and Roundup to the same points of destination on the Chicago, Milwaukee & St. Paul cannot be justified on the ground that the movement from Sheridan involves a two-line haul.

Where the physical connection between connecting carriers is as simple as in these small western towns, involving no expensive terminal service, the additional cost due to the switching movement is very small, so small in fact that it may not properly be made the basis of an additional charge for a two-line haul of substantial length.

The facts demonstrate the necessity of promulgating rates which will allow this coal to find a market in the territory described. In order to accomplish this there must be a free interchange of traffic at reasonable joint rates.

Joint rates should be established from the mines at Sheridan to certain points on the Chicago & North Western, which should in no case exceed the rate from Hudson, Wyo., to the same points of destination, except that the rate to common points of the Chicago, Burlington & Quincy and the Chicago & North Western need not be changed.

A joint rate should be established from Sheridan to Chamberlain, S. Dak., not to exceed that from Roundup to Chamberlain and this rate should be carried back as far as Okaton, S. Dak.

A differential of 25 cents is a reasonable allowance for the difference in the distance from Sheridan and from the Northern Pacific mines to certain points of destination within 500 miles of Sheridan. As the distance to points of destination increases, the differential between the rates from Sheridan and from Red Lodge should be further contracted, so as not to exceed 15 cents to points between 500 and 600 miles distant and not to exceed 5 cents to points between 600 and 700 miles distant. To points over 700 miles distant the rate from Sheridan should be the same as the rate from Red Lodge. (26 I. C. C., 638.)

STATE COMMISSIONS.

The Illinois Railroad and Warehouse Commission will hold a meeting at Chicago on May 14, for consideration of a docket of petitions for additions and changes in the Illinois commissioners' classification.

The Missouri Public Service Commission has called upon the railroads of the state to furnish it with their tariffs of passenger rates preliminary to an investigation of the reasonableness of the present rates.

The Atchison, Topeka & Santa Fe has filed an application with the Kansas Public Utilities Commission for an order increasing the minimum weight for a carload of grain from 24,000 lbs. to a figure nearer the capacity of the cars generally used.

Joseph L. Reilly, who has been secretary of the Railroad Commission of Indiana, has been appointed secretary of the new Public Utilities Commission, which succeeded the old commission on May 1. It is reported that the new commission proposes to adopt as many of the rules and methods of the Wisconsin commission as can be adapted to use in Indiana.

The Indiana Railroad Commission has issued an order in the case of the Winona College of Agriculture against the railways of the state, prescribing a schedule of distance rates on crushed limestone for use as fertilizer, effective June 15, which materially reduces the present rates. The new scale ranges from 35 cents per ton for distances under 10 miles, to $1.40 per ton for distances between 325 and 350 miles.

The Oregon Railroad Commission has issued an order calling upon the Southern Pacific, the Portland, Eugene & Eastern, the Salem, Falls City & Western, the Oregon Electric, the Oregon-Washington Railroad & Navigation Company, the Walla Walla Valley Traction Company, and the Pacific Railway & Navigation Company, to appear on May 14 and justify present regulations with relation to block signals, passing tracks, switching and the general control and operation of trains.

COURT NEWS.

Judge Reiter, of the Lake County Circuit Court of Indiana, has overruled a demurrer of the Grand Trunk in a suit brought by the railroad commission to recover $10,000 as penalty for failure to observe the order for the installation of block signals.

The Supreme Court of Wisconsin in a suit against the Minneapolis, St. Paul & Sault Ste. Marie, has dismissed the appeal of John D. Langowski from a decision by the circuit court. Three years ago the plaintiff and his family while out walking on Sunday had strolled out on a trestle over the Wisconsin river, near Stevens Point, when a passenger train came along. In their excitement Mrs. Langowski jumped and was killed upon the rocks below, and her son and husband were injured. The husband brought suit against the road to recover damages, and the circuit court dismissed the complaint.

Lands in Oregon aggregating 2,373,000 acres, held by the Southern Pacific by virtue of grants made by Congress to its predecessor, the Oregon & California, in 1866 and 1870, were declared forfeited to the United States government in a decree issued by Judge Wolverton of the United States district court, at Portland, Ore., on April 29. The decree was based on the ground that the railway company violated the terms under which the grant was made regarding the sale of lands to settlers, by not selling the lands to actual settlers at $2.50 an acre, by selling lands at a higher price than $2.50 per acre, and by selling more than 160 acres to one person. The case will be appealed to the higher courts.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1913.

Name of road.	Average mileage operated during period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Alabama & Vicksburg	143	$116,544	$35,717	$162,775	$25,908	$33,600	$3,391	$54,664	$5,353	$122,916	$39,859	—$289	$5,300	$34,270	$14,618
Atchison, Topeka & Santa Fe	8,242[1]	5,080,233	2,077,345	8,104,962	1,148,403	1,349,065	178,352	2,395,971	155,771	5,227,562	2,877,400	.....	339,914	2,537,486	191,514
Atlanta & West Point	93	60,658	36,527	106,992	11,522	18,829	5,546	33,053	4,520	73,470	33,522	129	6,344	27,307	—5,107
Atlanta, Birmingham & Atlantic	645[2]	242,622	44,788	311,447	43,825	48,293	12,725	121,213	11,020	237,076	74,371	.....	13,375	60,996	22,284
Atlantic & St. Lawrence	167	165,070	25,460	210,888	18,312	19,993	5,019	95,582	4,017	142,923	67,965	.....	16,152	51,813	43,416
Atlantic City	167	63,469	66,889	137,895	30,665	19,007	2,222	83,209	955	136,058	1,837	—4,397	9,000	—11,559	—8,477
Atlantic Coast Line	4,614[3]	2,601,837	904,321	3,759,122	398,311	495,570	57,533	1,234,919	80,605	2,266,938	1,492,184	.....	98,000	1,394,184	330,506
Baltimore & Ohio—System	4,455[4]	6,169,037	1,216,040	7,789,857	1,070,838	1,677,371	166,889	3,173,234	178,926	6,267,258	1,522,599	—68,961	278,476	1,175,162	—1,078,916
Baltimore & Ohio Chicago Terminal	77	.....	1,667	130,779	9,165	27,029	991	72,873	6,145	116,203	14,576	846	8,104	7,318	—15,612
Bangor & Aroostook	631[5]	265,335	49,191	327,108	40,151	43,776	2,823	142,928	13,885	243,563	83,545	.....	10,500	73,045	—62,386
Bessemer & Lake Erie	204	462,063	27,265	500,917	84,192	137,861	8,367	149,172	9,792	389,384	111,533	.....	35,000	76,533	24,483
Boston & Maine	2,244	2,287,601	1,152,324	3,731,291	388,734	735,122	35,094	2,113,163	117,243	3,389,356	341,935	$5,249	183,835	173,349	—143,902
Buffalo & Susquehanna *R. R.*	265	147,364	7,832	158,820	26,564	24,073	1,286	58,661	5,888	116,472	42,348	.....	2,200	40,148	9,788
Buffalo & Susquehanna *Ry.*	91	44,606	7,677	54,809	11,829	30,417	483	24,680	2,474	69,883	—15,074	—6	1,700	—16,780	6,167
Buffalo, Rochester & Pittsburgh	574[6]	720,135	87,588	832,657	83,836	178,255	11,166	303,072	19,402	595,731	236,926	—1,748	19,000	216,178	—24,090
Canadian Pacific Lines in Maine	233	143,741	45,171	206,894	14,043	26,701	6,406	78,095	4,917	130,162	76,732	.....	10,000	66,732	48,941
Carolina, Clinchfield & Ohio	238	178,246	13,694	196,254	13,750	20,620	6,866	38,090	11,404	90,730	105,524	2,276	8,000	99,800	7,376
Carolina, Clinch. & Ohio Ry. Co. of S. C.	18	12,585	1,425	14,216	1,374	81	1,002	2,965	358	5,780	8,436	.....	500	7,936	585
Central of Georgia	1,915	932,833	284,383	1,320,664	179,038	221,328	29,955	434,762	37,304	902,387	418,277	5,145	50,830	372,592	35,465
Central of New Jersey	676[7]	1,620,720	406,566	2,133,585	253,456	370,345	26,989	706,508	42,234	1,399,532	734,053	—53,361	122,593	558,099	—542,734
Central New England	277	248,453	28,585	293,238	37,675	30,689	1,265	78,337	2,513	150,479	142,759	—187	10,000	132,572	—57,511
Charleston & Western Carolina	341	169,117	26,062	203,945	31,390	31,538	3,191	76,001	4,860	146,980	56,965	.....	5,000	51,965	12,755
Chesapeake & Ohio Lines	2,324[8]	2,325,441	440,495	2,890,666	313,231	643,372	51,628	1,047,921	63,322	2,119,474	771,192	5,249	127,155	649,286	—271,384
Chicago & Alton	1,026	745,551	297,770	1,134,910	199,054	282,771	43,892	534,522	35,418	1,095,657	39,253	—1,657	45,200	—7,604	291,663
Chicago & Northwestern	7,976[9]	4,408,346	1,528,805	6,572,130	719,268	993,063	112,714	2,857,558	135,467	4,818,070	1,754,060	—5,905	293,000	1,455,155	157,663
Chicago, Burlington & Quincy	9,129[10]	4,980,228	1,572,710	7,129,395	934,482	1,340,067	132,321	2,638,307	214,535	5,259,712	1,869,683	—5,866	279,093	1,584,724	—227,836
Chicago Great Western	1,496	843,221	229,585	1,157,572	115,914	183,397	48,258	488,831	34,697	871,097	286,475	234	36,526	250,183	125,610
Chicago, Indiana & Southern	359	349,072	22,901	390,566	50,655	88,646	6,859	140,065	11,582	297,807	92,759	—68	15,282	77,409	—17,619
Chicago, Indianapolis & Louisville	617	321,403	104,510	477,952	116,780	80,395	18,850	200,072	13,821	429,918	48,034	.....	23,234	24,800	—71,330
Chicago, Milwaukee & St. Paul	9,592[11]	5,719,014	1,290,438	7,596,899	563,125	1,182,809	150,360	3,119,343	115,712	5,131,349	2,465,550	—6,326	328,704	2,130,520	448,486
Chicago, Peoria & St. Louis	255	103,346	24,041	133,728	19,996	27,619	6,543	72,964	5,541	132,663	1,065	.....	4,300	—3,235	—16,425
Chicago, Rock Island & Gulf	477	210,704	56,057	284,505	33,922	28,649	10,817	113,784	8,460	195,632	88,873	—534	7,935	80,404	46,216
Chicago, Rock Island & Pacific	7,566[12]	3,559,230	1,411,369	5,309,597	642,271	824,713	153,160	2,408,840	138,426	4,167,410	1,142,187	—13,942	236,483	891,762	109,574
Chicago, St. Paul, Minneapolis & Omaha	1,744	880,754	375,140	1,339,499	105,805	208,613	26,515	608,945	34,303	984,181	355,318	—2,151	70,102	283,065	28,151
Cincinnati, Hamilton & Dayton	1,015	506,147	100,339	678,611	130,448	161,374	16,891	342,904	18,353	669,970	8,641	.....	34,712	—26,071	—149,039
Cincinnati Northern	245	73,916	13,465	91,550	20,379	29,754	2,596	41,238	2,927	96,894	—5,344	.....	5,500	—10,844	2,793
Colorado Midland	338	94,015	12,964	119,447	16,190	36,094	8,118	56,978	5,789	123,169	—3,722	—1,269	8,000	—12,991	—59
Colorado & Southern	1,069[13]	563,969	86,647	697,912	79,666	168,329	13,539	214,579	22,752	498,865	199,047	—960	29,175	168,912	54,805
Cumberland Valley	162	230,257	50,760	295,059	51,494	36,822	3,975	102,152	8,785	203,228	91,831	69	5,703	86,197	4,246
Delaware, Lackawanna & Western	958	1,967,584	610,583	2,789,349	365,002	543,442	70,727	1,013,022	65,272	2,057,465	731,884	34,501	165,000	601,385	—309,739
Denver & Rio Grande	2,550[14]	1,357,940	352,612	1,786,145	240,413	370,381	41,946	608,522	55,148	1,316,410	469,735	—4,986	80,400	384,349	113,218
Denver, Northwestern & Pacific	215	48,685	10,978	63,233	14,084	18,977	2,030	30,037	5,282	70,410	—7,177	.....	3,500	—10,677	—10,466
Detroit & Mackinac	411[15]	82,878	26,063	115,785	9,562	17,113	1,867	39,064	2,469	70,075	45,710	—188	8,379	37,143	5,674
Detroit, Grand Haven & Milwaukee	191	113,000	45,500	184,992	20,371	36,642	6,993	124,072	5,257	193,335	—8,343	15	2,953	—11,281	—16,739
Detroit River Tunnel	2	.....	.....	122,895	2,501	3,250	.....	10,169	25	15,945	106,950	.....	6,000	100,950	12,855
Duluth & Iron Range	272[16]	73,922	23,653	104,465	38,035	47,729	922	69,904	9,239	165,829	—61,364	—3,211	5,328	—69,903	—28,195
Duluth, Missabe & Northern	356[17]	68,249	32,824	106,899	58,053	68,691	2,025	78,349	11,572	218,690	—111,791	—936	6,225	—118,952	—121,889
Duluth, South Shore & Atlantic	627[18]	184,773	60,622	258,777	46,682	31,727	7,220	127,324	7,523	220,476	38,301	—1,087	18,000	19,214	—20,482
El Paso & Southwestern Co	982[19]	630,013	105,966	765,934	102,852	102,852	16,863	226,038	25,905	474,510	291,424	—1,384	35,000	255,040	37,201
Elgin, Joliet & Eastern	820[20]	1,068,721	3	1,144,564	109,492	181,927	5,122	369,016	15,912	681,469	463,095	.....	50,220	412,875	—7,130
Erie	1,988[21]	3,203,237	704,564	4,260,771	347,218	831,551	101,328	1,523,518	104,074	2,907,689	1,353,082	—39,357	152,835	1,160,890	66,772
Florida East Coast	642[22]	314,923	326,107	726,988	60,514	69,327	9,182	213,569	11,837	364,429	362,559	—930	18,500	343,129	99,533
Fort Worth & Denver City	454	259,444	122,378	403,386	58,370	89,588	5,925	192,895	15,324	362,102	41,284	—1,384	9,086	30,814	—21,675
Galveston, Harrisburg & San Antonio	1,338	646,230	278,644	973,046	124,323	202,877	35,999	459,477	29,991	852,667	120,379	6,812	29,454	97,737	15,522
Grand Rapids & Indiana	578[23]	291,845	119,962	444,114	64,561	82,169	10,901	209,768	14,837	382,236	61,878	—175	23,640	38,063	—38,343
Grand Trunk Western	347	433,000	137,000	607,913	79,483	86,227	21,846	283,161	14,324	485,041	122,872	—2,129	29,877	90,866	17,504
Great Northern	7,783[24]	3,976,483	1,110,471	5,475,696	867,486	843,502	109,725	1,840,592	109,227	3,770,532	1,705,164	82	376,054	1,329,192	—328,456
Gulf & Ship Island	308	143,586	30,825	188,022	22,798	34,835	2,887	49,144	7,694	117,358	70,664	.....	8,749	61,915	20,971

Average mileage operated during previous period—[1] 8,201; [2] 662; [3] 4,527; [4] 4,434; [5] 628; [6] 572; [7] 672; [8] 2,281; [9] 7,951; [10] 9,074; [11] 9,570; [12] 7,565; [13] 1,075; [14] 2,545; [15] 358; [16] 274; [17] 342; [18] 624; [19] 902; [20] 841; [21] 1,995; [22] 630; [23] 586; [24] 7,345. — Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1913—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.					
Gulf, Colorado & Santa Fe	1,595[25]	$743,403	$218,259	$1,034,343	$187,590	$184,475	$27,677	$472,916	$34,946	$907,604	$126,739	.....	$38,407	$88,332	$32,041
Illinois Central	4,763	3,427,696	1,067,235	5,211,602	585,865	1,128,772	101,372	2,116,847	126,724	4,059,580	1,152,022	—$1,789	245,750	904,483	24,836
Kanawha & Michigan	177	202,132	27,046	234,457	37,650	56,394	2,747	71,588	6,753	175,132	59,325	—10	8,394	50,921	—4,194
Kansas City Southern	827	676,214	127,319	891,434	72,040	126,525	28,010	335,559	32,401	594,535	296,899	.....	41,142	255,757	111,824
Lake Shore & Michigan Southern	1,872[26]	3,234,807	982,263	4,754,601	515,938	912,035	100,549	1,750,195	106,339	3,385,056	1,369,545	1,111	150,000	1,220,656	—341,412
Lehigh Valley	1,452[27]	2,502,190	356,621	2,963,284	359,718	576,928	83,451	1,185,265	73,573	2,278,935	684,349	—21,720	118,500	544,129	—435,999
Long Island	399	277,208	495,462	807,070	129,879	112,135	15,212	414,920	31,783	703,929	103,141	10,181	61,532	51,790	—6,225
Louisville & Nashville	4,919[28]	3,605,147	1,018,834	4,925,451	926,785	957,872	103,299	1,764,198	121,005	3,873,159	1,052,292	4,031	161,241	895,082	—331,936
Midland Valley	373	63,982	38,179	108,582	27,498	22,874	2,679	43,165	6,220	102,436	6,146	—77	5,964	105	—24,415
Minneapolis & St. Louis	1,586	600,145	146,661	789,405	83,669	106,293	19,682	327,978	20,964	558,586	230,819	—74	32,631	198,114	72,196
Minneapolis, St. Paul & Sault Ste. Marie	3,976[29]	2,102,531	437,179	2,666,285	209,590	357,284	54,450	927,042	67,777	1,616,143	1,050,142	1,407	162,953	888,596	113,426
Missouri Pacific	3,920[30]	1,475,777	385,429	2,040,843	250,229	360,813	70,181	1,003,192	79,209	1,763,624	277,219	—3,703	95,100	178,416	119,721
Monongahela	65	145,302	2,980	150,286	14,666	14,440	394	27,850	2,282	59,632	90,654	.....	2,000	88,454	16,730
Nashville, Chattanooga & St. Louis	1,231	833,538	231,959	1,145,865	173,320	217,172	40,145	457,332	28,104	916,073	229,792	1,069	26,100	204,751	821
Nevada Northern	165	141,066	12,295	156,582	13,149	20,477	213	39,931	4,231	78,001	78,581	.....	7,053	71,528	3,833
New Orleans & North Eastern	196	252,688	53,858	331,714	39,053	63,052	9,651	131,567	11,491	254,814	76,900	—1,866	12,150	62,884	—6,642
New Orleans Great Northern	283	119,697	29,856	161,595	22,354	10,503	2,322	48,398	6,848	90,425	71,170	—59	2,334	68,777	27,239
New York Central & Hudson River	3,732[31]	5,585,831	2,642,272	9,204,204	1,198,588	1,858,775	197,591	3,680,417	249,085	7,184,456	2,019,748	7,638	575,111	1,452,275	—213,119
New York, Chicago & St. Louis	564[32]	824,622	83,085	940,086	101,654	161,226	46,063	488,222	18,985	816,150	123,936	—2,005	32,000	89,931	—170,684
New York, New Haven & Hartford	2,091	2,705,872	2,218,018	5,478,475	558,529	907,420	36,391	2,576,553	172,988	4,251,881	1,226,594	—25,820	310,000	890,774	—779,456
New York, Ontario & Western	565	575,539	88,623	692,344	95,729	140,149	13,626	274,729	16,771	541,004	151,340	—3,175	18,167	129,998	—19,344
New York, Philadelphia & Norfolk	112	240,271	37,038	296,931	24,902	57,501	4,997	138,761	13,320	239,481	57,450	.....	8,000	49,450	—5,579
Norfolk & Western	2,019[33]	3,102,172	355,158	3,568,830	377,770	722,421	58,224	1,130,307	64,861	2,353,583	1,215,247	1,192	122,000	1,094,439	149,102
Norfolk Southern	562	239,465	60,073	318,996	42,891	36,730	4,694	96,683	16,464	197,462	121,534	—604	7,510	113,420	12,291
Northern Central	472[34]	775,706	210,828	1,050,735	160,059	258,228	17,255	562,015	31,381	1,028,938	21,797	141	42,285	—20,347	—142,569
Northern Pacific	6,314[35]	4,195,391	1,092,963	5,619,874	642,485	662,125	117,966	2,018,766	90,297	3,531,639	2,088,235	576	385,134	1,703,677	48,184
Oregon Short Line	1,931[36]	1,181,038	359,179	1,658,780	221,915	288,802	33,364	460,856	50,700	1,055,637	603,143	—2,093	97,900	503,150	—144,272
Oregon-Washington R. R. & Nav. Co.	1,919	977,818	387,215	1,473,731	250,150	166,614	45,651	542,522	53,071	1,058,008	415,723	—9,465	96,673	309,585	79,100
Pennsylvania *Co.*	1,751[37]	3,377,827	737,635	4,500,198	847,404	1,016,008	90,233	1,899,133	103,032	3,955,810	544,388	—5,183	237,667	301,538	—568,240
Pennsylvania *Railroad*	4,025[38]	10,977,342	2,977,717	14,849,127	2,113,794	3,267,242	211,511	5,649,738	394,127	11,636,412	3,212,715	—188,886	584,134	2,439,696	—742,361
Philadelphia & Reading	1,015	3,188,653	534,422	3,923,597	304,122	721,830	39,212	1,450,454	58,535	2,574,153	1,349,444	25,051	86,490	1,288,005	—549,623
Philadelphia, Baltimore & Washington	713	822,626	801,309	1,787,368	299,609	321,585	34,644	779,876	51,202	1,486,916	300,452	.....	50,611	249,841	692
Pittsburgh, Cincinnati, Chic. & St. Louis	1,472[39]	2,301,245	509,677	3,222,968	576,526	786,985	74,872	1,393,785	74,681	2,906,849	316,119	—959	137,588	177,572	—773,777
Pittsburgh, Shawmut & Northern	279[40]	180,155	9,000	192,179	38,055	40,755	970	65,090	4,291	149,161	43,018	.....	1,595	41,423	—9,861
Port Reading	21	110,137	.....	111,966	15,109	660	30	34,979	112	50,890	61,076	3,293	8,000	56,369	—70,922
Rutland	468	149,446	84,243	268,792	33,053	65,367	9,594	114,894	7,450	230,358	38,434	.....	17,607	20,827	—16,775
St. Louis & San Francisco	4,742[41]	2,429,485	828,150	3,488,777	342,602	447,987	77,986	1,287,540	101,532	2,257,647	1,231,130	.....	163,200	1,067,930	238,655
St. Louis, Iron Mountain & Southern	3,365[42]	2,138,429	527,639	2,872,580	351,641	396,474	67,483	912,586	89,298	1,817,482	1,055,098	—3,064	88,935	963,099	88,069
St. Louis Merchants' Bridge Terminal	9	.....	359	168,723	33,585	16,416	707	99,452	5,249	155,409	13,314	.....	5,600	7,714	—39,431
St. Louis Southwestern of Texas	703	242,296	74,442	348,999	99,454	78,792	13,738	163,146	20,138	375,268	—26,269	—176	11,229	—37,674	—23,147
San Antonio & Aransas Pass	727	235,912	102,001	359,050	74,471	49,053	6,571	176,873	12,600	319,568	39,482	.....	10,000	29,482	—7,862
Seaboard	3,076[43]	1,646,019	522,434	2,383,444	241,072	324,555	63,291	837,616	62,428	1,528,962	854,482	—172	77,000	777,310	165,551
Southern	7,037[44]	4,139,700	1,444,642	6,034,570	789,202	947,794	183,644	2,128,489	166,761	4,215,890	1,818,680	5,260	208,947	1,614,993	85,577
Southern Pacific Co.	6,329[45]	4,241,870	2,625,653	7,442,556	781,938	1,064,861	186,868	2,198,472	214,019	4,446,158	2,996,398	114,560	342,780	2,768,178	307,053
Spokane, Portland & Seattle	556	243,615	120,092	390,755	61,174	41,596	6,354	107,297	12,583	229,004	161,751	—471	53,400	107,880	—17,888
Terminal R. R. Ass'n of St. Louis	34[46]	.....	288	237,854	41,740	27,028	810	99,673	6,400	175,651	62,203	11,358	25,560	48,001	—30,949
Texas & Pacific	1,885	1,004,103	363,676	1,455,894	163,309	265,791	36,797	715,688	44,510	1,226,095	229,799	2,005	54,583	177,221	108,736
Toledo, St. Louis & Western	451	296,947	21,814	339,347	44,938	43,498	15,262	126,914	8,719	239,331	100,016	.....	15,000	85,016	—7,964
Trinity & Brazos Valley	463	165,862	45,773	220,960	45,319	39,597	10,328	126,877	10,636	232,757	—11,797	.....	3,500	—15,297	—8,623
Union Pacific	3,578[47]	2,584,271	766,830	3,745,515	515,455	522,338	109,877	1,144,020	134,655	2,426,345	1,319,170	—8,850	168,350	1,141,970	358,834
Union R. R. of Baltimore	9	122,919	28,073	152,765	9,022	.....	1,410	5,835	2,899	19,166	133,599	.....	5,527	128,072	20,219
Union R. R. of Pennsylvania	31	.....	.....	315,541	39,495	83,766	100	154,187	4,277	281,825	33,716	481	8,500	25,697	144
Vandalia	827	535,186	169,765	787,994	129,716	195,681	27,608	344,245	21,359	718,609	69,385	.....	30,316	39,069	109,418
Vicksburg, Shreveport & Pacific	171	104,237	40,002	155,844	24,605	27,605	3,133	55,582	5,327	116,252	39,592	—522	6,900	32,170	11,036
Virginian	475[48]	494,211	26,174	534,034	64,068	96,337	5,163	124,427	9,034	298,029	236,005	6,252	17,600	224,657	96,102
West Jersey & Seashore	356	146,756	289,426	459,165	82,960	72,880	12,841	219,698	15,348	403,727	55,438	—5,383	27,310	22,745	23,997
Wheeling & Lake Erie	459[49]	396,211	37,581	464,031	96,177	126,378	8,528	180,614	25,592	437,289	26,742	1,385	28,187	—60	—182,911
Yazoo & Mississippi Valley	1,374	765,353	196,047	1,037,966	159,139	135,263	14,305	425,511	27,444	761,662	276,304	293	37,000	239,597	97,715

Average mileage operated during previous period—[25] 1,597; [26] 1,775; [27] 1,450; [28] 4,722; [29] 3,770; [30] 3,915; [31] 3,597; [32] 562; [33] 2,014; [34] 473; [35] 6,032; [36] 1,762; [37] 1,760; [38] 4,018; [39] 1,467; [40] 278; [41] 4,732; [42] 3,315; [43] 3,070; [44] 7,090; [45] 6,212; [46] 35; [47] 3,537; [48] 503; [49] 457. — Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

NINE MONTHS OF FISCAL YEAR 1913.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total, inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.					
Alabama & Vicksburg	143	$939,078	$371,699	$1,406,270	$215,883	$259,162	$32,444	$483,162	$50,617	$1,041,268	$365,002	—$1,723	$53,686	$309,593	$45,663
Atchison, Topeka & Santa Fe	8,242[1]	49,447,617	19,298,009	74,821,439	12,179,567	12,438,853	1,552,485	21,436,693	1,457,182	49,064,780	25,756,659	.....	3,059,181	22,697,478	2,545,749
Atlantic & St. Lawrence	167	974,890	244,028	1,331,286	226,588	196,653	41,701	682,426	35,373	1,182,741	148,545	.....	101,178	47,367	70,930
Atlanta, Birmingham & Atlantic	645[2]	1,823,739	504,162	2,494,051	401,361	392,279	138,478	982,680	103,738	2,018,536	475,515	.....	121,225	354,290	—149,908
Atlanta & West Point	93	495,813	372,280	959,485	116,881	170,970	48,595	309,384	44,783	690,613	268,872	1,356	57,096	213,132	—37,911
Atlantic City	167	570,678	959,893	1,622,644	267,950	127,923	24,940	850,425	12,385	1,283,623	339,021	—34,243	81,000	223,778	—82,999
Atlantic Coast Line	4,614[3]	18,454,157	6,909,650	27,353,161	3,601,764	4,106,280	469,540	9,491,618	692,700	18,361,902	8,991,259	.....	1,080,090	7,911,169	534,524
Baltimore & Ohio—System	4,455[4]	59,978,020	11,698,693	76,006,069	10,208,964	13,759,481	1,481,380	27,803,317	1,503,681	54,756,823	21,249,246	—647,588	2,164,679	18,436,979	698,980
Baltimore & Ohio Chicago Terminal	77	.....	17,893	1,334,065	173,526	216,289	6,703	625,293	42,508	1,064,319	269,746	7,885	161,026	116,605	60,167
Bangor & Aroostook	631[5]	1,734,371	477,575	2,343,768	402,372	299,675	29,874	841,853	111,704	1,685,478	658,290	.....	94,500	563,790	—300,979
Bessemer & Lake Erie	204	5,979,567	282,842	6,361,439	716,399	1,217,077	83,344	1,588,682	100,895	3,706,397	2,655,042	.....	125,000	2,530,042	292,775
Boston & Maine	2,244	21,607,583	12,214,055	36,617,411	4,319,817	5,737,960	314,124	17,582,830	920,620	28,875,351	7,742,060	136,836	1,624,499	6,254,397	—39,636
Buffalo & Susquehanna *R. R.*	265	1,251,526	75,517	1,364,587	259,121	203,713	10,891	472,495	53,032	999,252	365,335	.....	19,800	345,535	102,858
Buffalo & Susquehanna *Ry.*	91	378,715	84,921	485,489	102,836	252,480	4,222	205,735	23,672	588,945	—103,456	114	14,100	—117,442	27,194
Buffalo, Rochester & Pittsburgh	574[6]	6,969,441	859,377	8,122,215	1,111,227	1,623,849	104,762	2,676,543	168,810	5,685,191	2,437,024	—4,975	159,000	2,273,049	103,455
Canadian Pacific Lines in Maine	233	745,815	259,308	1,088,214	248,134	156,948	53,469	461,239	46,061	966,451	121,763	.....	90,000	31,763	17,396
Carolina, Clinchfield & Ohio	238	1,647,978	136,300	1,823,433	124,382	187,746	61,363	319,446	70,682	763,619	1,059,814	2,275	72,000	990,089	196,524
Carolina, Clinch. & Ohio Ry. Co. of S. C.	18	101,936	14,775	118,772	8,035	803	9,438	23,347	3,861	45,484	73,288	.....	4,500	68,788	14,194
Central of New Jersey	676[7]	16,152,441	4,143,984	21,468,381	1,899,020	3,136,668	268,950	6,401,396	383,199	12,089,233	9,379,148	—30,563	1,116,759	8,231,826	278,001
Central of Georgia	1,915	6,985,062	2,967,105	10,892,601	1,547,039	1,943,951	313,483	3,681,673	348,749	7,834,895	3,057,706	54,717	453,780	2,658,643	—254,069
Central New England	277	2,379,442	263,415	2,177,682	375,370	255,909	10,722	774,213	31,229	1,447,443	1,330,239	—3,784	90,000	1,236,455	10,598
Charleston & Western Carolina	341	1,114,502	277,869	1,465,915	258,795	231,671	29,474	552,429	42,439	1,114,808	351,107	.....	45,000	306,107	—29,211
Chesapeake & Ohio Lines	2,324[8]	21,127,559	4,400,165	26,712,847	3,058,805	5,702,578	500,724	8,536,118	589,203	18,387,428	8,325,419	34,116	994,395	7,365,140	—502,791
Chicago & Alton	1,026	7,587,147	3,192,199	11,628,245	1,784,680	2,701,519	390,493	4,385,223	300,670	9,561,985	2,066,260	—20,329	352,900	1,693,031	—755,632
Chicago & Northwestern	7,976[9]	41,447,221	15,688,610	62,937,395	7,759,232	8,900,458	1,029,716	24,527,168	1,170,981	43,387,555	19,549,840	6,759	2,717,000	16,839,599	4.103,594
Chicago, Burlington & Quincy	9,129[10]	49,235,542	16,813,629	72,501,539	7,442,014	12,007,904	1,178,716	22,862,855	1,929,758	45,421,247	27,080,292	—111,710	2,552,043	24,416,539	3,968,008
Chicago Great Western	1,496	7,422,241	2,390,675	10,613,016	1,185,903	1,517,596	419,077	4,195,729	310,284	7,628,589	2,984,427	362	318,793	2,665,996	747,445
Chicago, Indiana & Southern	359	3,006,776	228,885	3,350,314	425,779	820,846	71,222	1,137,285	85,991	2,541,123	809,191	3,410	149,554	663,047	274,122
Chicago, Indianapolis & Louisville	617	3,413,979	1,241,521	5,135,547	773,704	714,837	162,653	1,946,715	133,716	3,731,625	1,403,922	.....	208,575	1,195,347	—1,294
Chicago, Milwaukee & St. Paul	9,592[11]	52,240,264	13,911,436	71,947,201	7,449,452	10,302,865	1,433,457	26,892,596	929,811	47,008,181	24,939,020	124,580	2,850,431	22,213,169	8,277,965
Chicago, Peoria & St. Louis†	255	305,383	67,396	394,076	54,531	72,259	21,064	209,272	20,088	377,214	16,862	.....	12,900	3,962	21,276
Chicago, Rock Island & Gulf	477	1,928,321	539,946	2,626,870	297,799	236,494	92,613	923,293	73,378	1,623,577	1,003,293	—5,520	64,940	932,833	193,199
Chicago, Rock Island & Pacific	7,566[12]	34,008,194	14,620,270	51,783,349	7,450,877	7,444,270	1,409,156	20,955,412	1,244,738	38,504,453	13,278,896	—144,573	2,145,024	10,989,299	1,276,341
Chicago, St. Paul, Minneapolis & Omaha	1,744	8,379,234	3,840,151	13,078,850	1,577,137	1,698,949	258,082	5,220,198	293,187	9,047,553	4,031,297	—4,700	629,791	3,396,806	548,587
Cincinnati, Hamilton & Dayton	1,015	5,737,463	1,229,080	7,767,156	940,346	1,390,312	175,988	3,302,154	174,023	5,982,823	1,784,333	.....	320,238	1,464,095	—157,906
Cincinnati Northern	245	874,961	162,713	1,089,750	167,645	224,009	23,682	443,161	29,256	887,753	201,997	.....	49,362	152,635	68,764
Colorado Midland	338	1,142,212	201,440	1,480,558	184,768	309,140	64,848	645,381	50,641	1,254,778	225,780	—523	77,600	147,657	—34,108
Colorado & Southern	1,069[13]	5,198,830	1,068,982	6,699,540	849,076	1,489,769	97,405	1,997,582	197,712	4,631,544	2,067,996	—7,100	263,733	1,797,163	20,145
Cumberland Valley	162	1,968,762	530,311	2,619,820	465,282	316,356	39,820	871,994	74,178	1,767,630	852,190	320	54,133	798,377	143,336
Delaware, Lackawanna & Western	958	22,168,078	6,077,938	30,274,527	3,417,538	4,643,054	598,569	9,361,677	593,077	18,613,915	11,660,612	457,412	1,253,340	10,864,684	1,495,950
Denver & Rio Grande	2,550[14]	14,072,406	3,953,775	18,853,734	2,331,928	3,387,359	416,897	6,128,882	512,679	12,977,745	6,075,989	—863	723,700	5,351,426	1,216,658
Denver, Northwestern & Pacific	215	610,286	222,201	872,515	136,814	151,229	17,331	297,569	43,514	646,457	226,058	.....	31,500	194,558	—41,165
Detroit & Mackinac	411[15]	592,425	261,530	919,449	128,614	129,132	19,912	333,356	25,868	636,882	282,567	1,026	78,340	205,253	36,410
Detroit, Grand Haven & Milwaukee	191	1,133,997	497,784	1,889,152	452,663	249,443	63,377	988,097	44,964	1,798,544	90,608	—501	26,578	63,529	—178,988
Detroit River Tunnel	2	.....	.....	945,050	20,017	25,539	.....	78,956	368	124,880	820,170	.....	43,508	776,662	—74,256
Duluth & Iron Range	272[16]	4,583,990	194,148	4,859,560	598,752	512,835	8,535	1,115,253	112,066	2,347,441	2,512,119	15,685	235,237	2,292,567	—51,985
Duluth, Missabe & Northern	356[17]	5,221,625	328,286	5,616,046	651,423	706,666	18,549	1,174,389	119,031	2,670,058	2,945,988	16,174	269,309	2,692,853	287,601
Duluth, South Shore & Atlantic	627[18]	1,635,338	717,522	2,476,129	501,837	294,190	86,172	1,004,574	92,095	1,978,868	497,261	4,283	161,913	339,631	—123,982
El Paso & Southwestern Co	982[19]	5,380,574	831,144	6,497,849	745,988	866,729	125,630	1,776,449	235,849	3,750,645	2,747,204	—17,133	273,953	2,456,118	475,016
Elgin, Joliet & Eastern	820[20]	9,167,515	57	9,900,662	1,025,705	1,502,874	44,104	2,803,240	160,299	5,536,222	4,364,440	.....	257,273	4,107,167	1,231,888
Erie	1,988[21]	30,261,991	7,072,168	40,590,615	4,387,723	7,216,624	871,273	13,580,483	799,936	26,856,039	13,734,576	—280,935	1,332,650	12,120,991	1,342,374
Florida East Coast	642[22]	1,822,956	1,515,948	3,810,171	582,537	525,685	73,333	1,356,790	107,107	2,645,452	1,164,719	—11,651	145,500	1,007,568	257,219
Fort Worth & Denver City	454	2,749,407	1,226,417	4,174,724	422,702	731,216	61,374	1,432,277	132,761	2,780,330	1,394,394	—5,585	97,460	1,291,349	27,284
Galveston, Harrisburg & San Antonio	1,338	6,392,668	2,423,151	9,298,430	926,016	1,953,551	304,937	3,721,559	277,329	7,183,392	2,115,038	—26,576	285,435	1,803,027	219,703
Grand Rapids & Indiana	578[23]	2,480,657	1,388,841	4,197,356	545,372	658,239	103,714	1,769,380	140,242	3,216,947	980,409	5	214,142	766,272	45,397
Grand Trunk Western	347	3,488,840	1,672,009	5,506,804	629,197	767,602	194,282	2,339,348	142,395	4,072,824	1,433,980	—14,036	268,894	1,151,050	66,491
Great Northern	7,783[24]	43,706,833	11,240,553	58,766,649	7,639,660	7,092,040	897,789	16,142,740	969,863	32,742,092	26,024,557	113,661	2,904,031	23,234,187	2,550,519
Gulf & Ship Island	308	1,143,594	313,376	1,567,852	212,672	279,453	25,209	415,113	74,236	1,006,683	561,169	.....	60,704	500,465	50,545

†Figures shown here are for period January 1 to March 31.

Average mileage operated during previous period—[1] 8,201; [2] 662; [3] 4,527; [4] 4,434; [5] 628; [6] 572; [7] 672; [8] 2,281; [9] 7,951; [10] 9,074; [11] 9,570; [12] 7,565; [13] 1,075; [14] 2,545; [15] 358; [16] 274; [17] 342; [18] 624; [19] 902; [20] 841; [21] 1,995; [22] 630; [23] 586; [24] 7,345. — Indicates Deficits, Losses and Decreases.

REVENUES AND EXPENSES OF RAILWAYS.

NINE MONTHS OF FISCAL YEAR 1913—CONTINUED.

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance: Way and structures.	Maintenance: Of equipment.	Traffic.	Transportation.	General.	Total.					
Gulf, Colorado & Santa Fe	1,595[25]	$7,821,425	$2,318,508	$10,758,296	$1,717,109	$1,565,711	$221,904	$3,910,025	$306,552	$7,721,301	$3,036,995	.....	$358,683	$2,678,312	$681,260
Illinois Central	4,763	32,161,517	10,386,860	48,833,637	6,380,038	10,414,876	1,012,665	18,917,883	1,133,193	37,858,655	10,974,982	—$63,276	2,155,750	8,755,956	3,051,539
Kanawha & Michigan	177	2,098,715	283,538	2,435,249	339,393	457,387	21,428	703,413	58,386	1,580,007	855,242	—154	79,869	775,219	—37,549
Kansas City Southern	827	6,040,196	1,270,373	8,102,197	758,723	1,023,524	235,478	2,701,831	292,171	5,011,727	3,090,470	.....	341,914	2,748,556	787,072
Lake Shore & Michigan Southern	1,872[26]	29,352,893	9,370,838	43,510,034	5,118,286	7,485,734	751,408	14,061,067	755,898	28,172,393	15,337,641	105,423	1,381,098	14,061,966	1,155,933
Lehigh Valley	1,452[27]	27,261,283	3,614,899	31,973,908	4,297,840	5,393,636	716,246	10,478,639	627,778	21,514,139	10,459,769	—137,845	1,060,500	9,261,424	903,863
Long Island	399	2,600,582	5,471,211	8,480,329	1,148,768	976,333	129,804	3,738,213	221,122	6,214,240	2,266,089	418,167	528,970	2,155,286	272,087
Louisville & Nashville	4,919[28]	32,364,609	9,724,212	44,867,163	7,542,659	8,495,403	941,612	14,749,958	1,041,912	32,771,544	12,095,619	—3,130	1,396,175	10,696,314	—1,128,055
Midland Valley	373	725,941	363,261	1,149,699	281,771	194,668	23,720	383,417	50,510	934,086	215,613	1,828	53,705	163,736	—58,619
Minneapolis & St. Louis	1,586	5,678,803	1,428,374	7,529,377	941,686	950,200	161,483	2,905,955	188,274	5,147,598	2,381,779	—338	284,067	2,097,374	1,055,610
Minneapolis, St. Paul & Sault Ste. Marie	3,976[29]	17,860,171	5,034,355	24,136,171	2,340,692	2,920,402	482,542	7,564,746	503,319	13,811,701	10,324,470	121,412	1,302,978	9,142,904	2,374,628
Missouri Pacific	3,920[30]	15,736,264	3,902,094	21,394,453	3,195,886	3,789,782	559,195	9,024,720	617,327	17,186,910	4,207,543	—28,153	853,530	3,325,860	2,071,442
Monongahela	65	1,229,012	22,747	1,267,848	141,345	95,230	3,120	241,037	18,460	499,192	768,656	.....	20,643	748,013	230,481
Nashville, Chattanooga & St. Louis	1,231	6,977,946	2,349,458	10,015,824	1,540,859	1,781,623	356,765	3,839,183	261,299	7,779,729	2,236,095	—3,689	230,132	2,002,274	104,404
Nevada Northern	165	1,049,253	135,309	1,216,834	132,202	143,385	3,510	275,042	31,968	586,107	630,727	.....	56,359	574,368	56,581
New Orleans & North Eastern	196	2,081,809	492,715	2,788,681	296,458	535,146	88,616	1,089,662	110,077	2,119,959	668,722	—2,325	112,081	554,316	—137,499
New Orleans Great Northern	283	935,877	269,896	1,307,420	198,777	128,653	22,140	390,730	59,878	800,178	507,242	—525	19,718	486,999	114,735
New York Central & Hudson River	3,732[31]	50,965,436	25,394,497	85,243,400	11,335,831	15,800,648	1,653,323	31,112,715	2,099,098	62,001,615	23,241,785	329,436	4,668,053	18,903,168	1,476,197
New York, Chicago & St. Louis	564[32]	8,100,683	1,156,398	9,584,379	931,573	1,284,567	457,565	4,090,065	155,064	6,918,834	2,665,545	—15,757	297,583	2,352,205	92,157
New York, New Haven & Hartford	2,091	25,819,714	20,982,897	51,755,704	5,686,430	6,960,293	283,974	20,650,106	1,451,343	35,032,146	16,723,558	714,498	2,895,000	14,543,056	—677,996
New York, Ontario & Western	565	5,745,100	1,299,894	7,117,525	892,569	1,125,995	101,977	2,624,438	150,771	4,895,750	2,221,775	—7,626	163,500	2,050,649	374,770
New York, Philadelphia & Norfolk	112	2,125,502	377,837	2,708,521	218,722	486,912	36,952	1,185,799	114,799	2,043,184	665,337	.....	71,400	593,937	26,550
Norfolk & Western	2,019[33]	28,292,942	3,578,905	32,942,971	4,008,733	6,139,093	508,695	9,733,044	601,457	20,991,022	11,951,949	—19,443	1,086,000	10,846,506	1,595,850
Norfolk Southern	562	1,682,930	611,699	2,503,590	307,601	330,652	43,519	785,971	137,910	1,605,653	897,937	—9,917	67,588	820,432	66,528
Northern Central	472[34]	7,461,122	1,839,715	9,946,302	1,203,798	1,990,031	144,580	4,787,603	244,101	8,370,113	1,576,189	5,234	374,379	1,207,044	189,815
Northern Pacific	6,314[35]	40,154,806	11,734,309	55,187,255	6,885,969	6,241,755	947,014	17,869,995	780,753	32,725,486	22,461,769	276,644	2,935,091	19,803,322	2,540,062
Oregon Short Line	1,931[36]	12,278,965	3,678,876	17,003,007	1,742,300	1,945,337	276,850	4,274,598	388,423	8,627,508	8,375,499	4,255	1,125,977	7,253,777	376,150
Oregon-Washington R. R. & Nav. Co	1,919	9,107,325	3,821,667	13,843,157	1,837,352	1,506,788	411,264	5,023,337	438,780	9,217,521	4,625,636	—37,727	863,439	3,724,470	423,835
Pennsylvania *Co.*	1,751[37]	37,374,511	7,370,414	49,320,440	7,810,632	9,118,295	754,336	17,322,751	904,021	35,910,035	13,410,405	—37,377	2,184,247	11,188,781	1,339,462
Pennsylvania *Railroad*	4,025[38]	99,249,910	27,592,941	135,836,760	17,618,587	28,762,381	1,757,266	48,869,095	3,185,660	100,192,989	35,643,771	—946,189	5,526,239	29,171,343	1,741,389
Philadelphia & Reading	1,015	30,970,993	5,282,734	38,115,928	3,312,621	6,235,028	372,172	12,241,853	546,635	22,708,309	15,407,619	307,702	776,880	14,938,441	2,327,196
Philadelphia, Baltimore & Washington	713	7,742,231	6,383,472	15,707,267	2,587,249	2,779,258	261,437	6,545,005	400,727	12,573,676	3,133,591	.....	486,645	2,646,946	—186,548
Pittsburgh, Cincinnati, Chic. & St. Louis	1,472[39]	24,086,959	6,234,995	33,835,260	5,115,871	6,666,862	642,658	12,343,646	645,704	25,414,741	8,420,519	—7,639	1,262,174	7,150,706	—295,550
Pittsburgh, Shawmut & Northern	279[40]	1,387,355	84,729	1,495,967	234,480	324,966	10,360	476,549	35,021	1,081,376	414,591	.....	14,296	400,295	10,877
Port Reading	21	1,178,400	.....	1,201,350	91,930	3,166	272	324,766	1,354	421,488	779,862	56,055	72,000	763,917	112,889
Rutland	468	1,493,828	923,104	2,772,534	332,384	554,790	75,311	1,110,652	59,663	2,132,800	639,734	.....	129,981	509,753	—89,716
St. Louis & San Francisco	4,742[41]	22,434,889	8,388,939	33,056,487	3,938,973	4,239,881	711,671	11,690,901	910,516	21,491,942	11,564,545	.....	1,516,284	10,048,261	1,241,518
St. Louis, Iron Mountain & Southern	3,365[42]	19,348,548	4,974,084	26,173,968	4,266,589	3,797,667	508,707	8,180,614	636,879	17,390,456	8,783,512	—39,165	808,995	7,935,352	1,255,108
St. Louis Merchants' Bridge Terminal	9	.....	3,282	1,608,312	271,430	85,117	6,192	825,202	55,631	1,243,572	364,740	.....	52,450	312,290	95,703
St. Louis Southwestern of Texas	703	2,624,613	874,344	3,742,361	733,738	710,862	122,192	1,495,264	178,274	3,240,330	502,031	—1,772	97,391	402,868	—51,929
San Antonio & Aransas Pass	727	2,743,594	1,072,857	4,008,577	612,086	490,224	55,230	1,505,928	97,604	2,761,072	1,247,505	.....	105,000	1,142,505	151,753
Seaboard	3,076[43]	12,517,674	4,022,499	18,364,623	2,424,994	2,525,468	571,284	6,619,332	515,917	12,656,995	5,707,628	—18,204	725,000	4,964,424	663,681
Southern	7,037[44]	34,245,711	13,863,999	52,119,003	6,861,730	8,510,904	1,538,553	17,676,488	1,499,638	36,087,313	16,031,690	54,839	1,864,787	14,221,742	654,787
Southern Pacific Co.	6,329[45]	43,018,726	24,054,946	72,123,006	7,722,508	9,896,003	1,547,882	20,134,998	1,932,934	41,234,325	30,888,681	1,273,525	3,337,870	28,824,336	2,615,567
Spokane, Portland & Seattle	556	2,452,103	1,246,318	4,025,282	464,958	349,890	66,506	986,327	115,157	1,982,838	2,042,444	1,504	480,600	1,563,348	77,373
Terminal R. R. Ass'n of St. Louis	34[46]	.....	2,551	2,278,907	351,736	158,799	8,227	859,221	60,878	1,438,861	840,046	97,733	243,205	694,574	127,730
Texas & Pacific	1,885	9,774,536	3,506,663	14,175,554	1,743,716	2,239,228	305,983	6,410,836	415,492	11,115,255	3,060,299	—20,175	494,621	2,545,503	—535,377
Toledo, St. Louis & Western	451	2,742,757	269,901	3,203,407	408,003	420,272	114,423	1,124,802	81,752	2,149,252	1,054,155	.....	133,600	920,555	214,035
Trinity & Brazos Valley	463	1,842,911	448,273	2,381,877	386,013	303,465	92,424	1,100,073	110,447	1,992,422	389,455	.....	36,013	353,442	63,611
Union Pacific	3,578[47]	28,023,646	8,016,925	39,581,712	4,144,873	4,668,757	810,136	10,632,851	1,019,499	21,276,116	18,305,596	—33,491	1,622,748	16,649,357	2,498,590
Union R. R. of Baltimore	9	1,105,848	209,725	1,330,640	84,617	.....	8,315	48,190	24,718	165,840	1,164,800	.....	50,422	1,114,378	190,849
Union R. R. of Pennsylvania	31	.....	.....	3,385,119	268,288	774,043	1,016	1,304,232	36,169	2,383,748	1,001,371	18,609	59,750	960,230	111,465
Vandalia	827	5,878,627	1,813,456	8,537,809	1,104,874	1,691,976	229,440	3,184,149	171,024	6,381,463	2,156,346	.....	278,217	1,878,129	371,391
Vicksburg, Shreveport & Pacific	171	791,904	401,964	1,301,899	253,972	228,241	30,026	413,570	46,160	971,969	329,930	—3,949	54,535	271,446	33,949
Virginian	475[48]	4,006,660	234,798	4,355,301	549,805	810,565	47,458	1,032,594	79,493	2,519,915	1,835,386	53,679	158,300	1,730,765	441,577
West Jersey & Seashore	356	1,397,638	3,162,080	4,863,877	715,843	740,566	129,922	1,998,382	119,471	3,704,184	1,159,693	—38,310	200,825	920,558	312,502
Wheeling & Lake Erie	459[49]	5,129,495	485,364	5,945,375	785,640	1,165,959	73,312	1,933,478	156,806	4,115,195	1,830,180	22,996	271,272	1,581,904	—173,186
Yazoo & Mississippi Valley	1,374	5,868,113	2,042,064	8,510,716	1,534,820	1,215,509	135,842	3,364,095	239,710	6,489,976	2,020,740	1,276	333,000	1,689,016	295,783

Average mileage operated during previous period—[25] 1,597; [26] 1,775; [27] 1,450; [28] 4,722; [29] 3,770; [30] 3,915; [31] 3,597; [32] 562; [33] 2,014; [34] 473; [35] 6,032; [36] 1,762; [37] 1,760; [38] 4,018; [39] 1,467; [40] 278; [41] 4,732; [42] 3,315; [43] 3,070; [44] 7,090; [45] 6,212; [46] 35; [47] 3,537; [48] 503; [49] 457. — Indicates Deficits, Losses and Decreases.

Railway Officers.

Executive, Financial and Legal Officers.

L. C. Everett, general auditor of the Bangor & Aroostook at Bangor, Me., having resigned, A. W. Grindle has been appointed acting general auditor, with office at Bangor.

J. T. Ehricht has been appointed auditor of the Wichita Valley with headquarters at Wichita Falls, Tex., succeeding W. C. Logan, resigned to accept service with another company.

W. A. Colston, commerce attorney of the Louisville & Nashville, at Louisville, Ky., has been appointed general solicitor, with headquarters at Louisville, succeeding A. S. Brandies, deceased.

The officers of the Alabama, Florida & Southern are: E. L. Marbury, president; W. S. Wilson, vice-president and general manager, and W. F. Bray, auditor and traffic manager, all with offices at Malone, Fla.

The East Tennessee & Western North Carolina has taken over the Linville River Railway, and the officers are now as follows: Edgar P. Earle, president; A. Pardee, vice-president, and John S. Wise, secretary and treasurer.

Thomas J. Freeman, president of the International & Great Northern, and operating vice-president of the Texas & Pacific, has resigned as vice-president to become general counsel of the latter company, the vice-presidency of which will be assumed by E. F. Kearney, general superintendent of transportation of the Missouri Pacific at St. Louis, Mo.

Vice-president A. R. Whaley of the New York, New Haven & Hartford, and the Central New England, is now in charge of the engineering, construction and maintenance department of these companies, in addition to his duties as head of the operating department. Vice-president E. H. McHenry, who has been in charge of the engineering, construction and maintenance department, has resigned, as heretofore announced, and he retired from the service of the company May 1.

Operating Officers.

John W. Hoffman has resigned as general manager of the Missouri, Oklahoma & Gulf.

W. A. Durham, assistant general manager of the Missouri, Kansas & Texas, with headquarters at St. Louis, Mo., having resigned, the position is abolished.

John McNaughton has beeen appointed trainmaster of the Erie Railroad and the New Jersey & New York, with office at Jersey City, N. J., succeeding H. R. Cole, transferred.

D. Sullivan, formerly division superintendent of the Missouri, Kansas & Texas, has been appointed general superintendent of the Apalachicola & Northern, with headquarters at Port St. Joe, Fla.

D. C. Frederick, car service agent of the Chicago, Peoria & St. Louis, has been appointed superintendent of transportation, with headquarters at Springfield, Ill., succeeding W. D. Danley, resigned.

J. H. Clark, assistant superintendent of floating equipment of the Baltimore & Ohio at New York, has been appointed superintendent of floating equipment, with headquarters at Baltimore, Md., succeeding Walter Ancker, deceased.

James D. Beaver, trainmaster of the Pittsburg, Shawmut & Northern at St. Marys, Pa., has been apopinted assistant superintendent, with office at St. Marys, and James T. Colbert has been appointed trainmaster, with office at St. Marys Junction.

W. H. Averell, assistant general superintendent of the Baltimore & Ohio at Pittsburgh, Pa., has been transferred to a position with the same title at New York, and has also been appointed general superintendent of the Staten Island Railway Company and the Staten Island Rapid Transit Railway Company, B. & O. lines operated on Staten Island. A sketch of Mr. Averell's railway career was published in the *Railway Age Gazette* of July 26, 1912, page 181.

L. J. Ferritor, superintendent of the Scranton division of the Delaware, Lackawanna & Western at Scranton, Pa., has been appointed superintendent of the Buffalo division, with office at Buffalo, N. Y., succeeding M. H. Cahill, resigned, and P. N. Place has been appointed acting superintendent of the Scranton division, with office at Scranton, succeeding Mr. Ferritor. A portrait of Mr. Ferritor and a sketch of his railway career were published in the *Railway Age Gazette* of January 17, 1913, p. 128.

Traffic Officers.

W. K. Cundiff, assistant general passenger agent of the Union Pacific System at Omaha, Neb., has been transferred to Kansas City, Mo., in a similar capacity.

Edward Briggs, general agent of the Wheeling & Lake Erie, at Cleveland, Ohio, has been appointed assistant general freight agent, with office at Cleveland.

Harry J. Flynn has been appointed soliciting freight agent of the St. Louis Southwestern, with office at Louisville, Ky., in place of C. C. Rockenbach, transferred.

J. W. Overman has been appointed traveling freight agent of the Toledo, St. Louis & Western, with headquarters at Kansas City, Mo., in place of E. C. Ferguson, promoted.

Emil J. Bauer has been appointed manager of lighterage and foreign freight departments of the Erie, with headquarters at New York, succeeding Arthur J. Grymes, resigned.

Marshall Taylor has been appointed city ticket agent of the Chicago, Milwaukee & St. Paul, at Portland, Ore., in place of J. O. Thomas, resigned to engage in the real estate business.

W. H. Saunders, traveling traffic inspector of the Cincinnati, New Orleans & Texas Pacific at Cincinnati, Ohio, has been appointed soliciting freight agent with headquarters at Cincinnati, succeeding W. S. Logan, transferred, and C. J. Scherer succeeds Mr. Saunders.

A. B. Day, traveling passenger agent of the Delaware, Lackawanna & Western at Buffalo, N. Y., has been transferred in the same capacity to Chicago, succeeding H. C. Dickson, deceased, and F. S. Clark has been appointed traveling passenger agent at Buffalo, succeeding Mr. Day.

Owing to the resignation of George A. Blair as general traffic manager of the Chicago & Alton, until further notice C. A. King, freight traffic manager, will have charge of freight traffic, and George J. Charlton, passenger traffic manager, will have charge of passenger traffic, both with headquarters at Chicago.

George H. Clark has been appointed division freight and passenger agent of the Ottawa division of the New York Central & Hudson River extending from Tupper Lake, N. Y., to Nyando, with headquarters at Ottawa, Ont. This new division was formerly the New York & Ottawa Railway. Mr. Clark also retains the position of general freight and passenger agent of the Ottawa & New York, which is the Canadian end of the New York Central line to Ottawa.

Engineering and Rolling Stock Officers.

Arthur N. Carver has resigned as division engineer of the San Benito & Rio Grande Valley at Mission, Tex.

H. E. Myers has been appointed shop superintendent of the Lehigh Valley, with headquarters at Packerton, Pa.

Charles Boertman has been appointed superintendent of shops of the Pere Marquette at Saginaw, Mich., in place of George Hilferink.

K. A. Dunphy has been appointed resident engineer of the Canadian Pacific, District No. 2, Alberta division, with headquarters at Calgary, Alta., in place of J. Robertson.

W. W. Morrison has been appointed assistant signal engineer of the Electric Zone and the Electric division of the New York Central & Hudson River, succeeding R. C. Johnson, resigned.

T. M. Vickers, formerly master mechanic of the San Pedro, Los Angeles & Salt Lake, has been appointed general foreman of the Oregon Short Line at Pocatello, Idaho, effective May 1.

Joseph E. Crawford, bridge engineer of the Norfolk & Western at Roanoke, Va., has been appointed acting chief engineer, succeeding Charles S. Churchill, assigned to special duty.

T. J. Burke, division engineer of the Lehigh Valley at Auburn, N. Y., has been appointed division engineer on the Mahanoy & Hazleton division, with office at Hazleton, Pa., succeeding J. A. Zehner, resigned.

K. B. Duncan, office engineer of the Atchison, Topeka & Santa Fe, at Topeka, Kan., has been appointed engineer of the Gulf, Colorado & Santa Fe, with office at Galveston, Tex., succeeding R. A. Rutledge, promoted.

B. C. Martin, resident engineer of the New York Central & Hudson River at Utica, N. Y., has been appointed assistant district engineer, Hudson division, with headquarters at Poughkeepsie; and G. F. Chisholm, resident engineer at Rome, succeeds Mr. Martin.

W. B. Willis has been appointed assistant division engineer of the Monongah division of the Baltimore & Ohio, with headquarters at Grafton, W. Va., succeeding H. F. Kloss, transferred, and D. W. Whisner has been appointed supervisor of subdivision No. 11, with headquarters at Clarksburg.

W. S. Murray, electrical engineer of the New York, New Haven & Hartford at New Haven, Conn., has resigned, and has formed a partnership with E. H. McHenry, under the firm name of McHenry & Murray, engineers. Mr. McHenry resigned as vice-president of the New Haven on May 1. (See an item in Supply Trade News.)

H. W. Wagner, principal assistant engineer Western lines of the Atchison, Topeka & Santa Fe at Amarillo, Tex., has been appointed engineer of the Western lines, Northern district, with headquarters at La Junta, Col., succeeding F. M. Bisbee, promoted, and N. R. Cullings has been appointed engineer of the Western lines, Southern district, with headquarters at Amarillo, Tex.

C. M. Nye has been appointed principal assistant engineer of the Great Northern, with headquarters at St. Paul, Minn. Oscar S. Bowen, resident engineer at Spokane, Wash., has been appointed resident engineer at Seattle, Wash., in place of R. L. Beaulieu, and will have jurisdiction over the Western district. The jurisdiction of P. S. Hervin, resident engineer at Great Falls, Mont., has been revised to cover the Montana and Butte divisions and the Central district. The positions of assistant chief engineer at St. Paul and resident engineer at Spokane are abolished. H. S. Wollan has been appointed acting resident engineer at Superior, Wis., with jurisdiction over the Lake district. The jurisdiction of H. F. Hamilton, resident engineer at St. Paul, has been revised to cover the Eastern district. The effect of the changes is to make the jurisdiction of the four resident engineers correspond with that of the general superintendents to place their headquarters at the same places.

Purchasing Officers.

C. C. Colley has been appointed purchasing agent of the Louisiana Railway & Navigation Company, with headquarters at Shreveport, La., in place of G. E. Smith, resigned.

Special Officers.

C. E. L. Bergstrom has been appointed assistant industrial commissioner of the Erie, the New York, Susquehanna & Western, the New Jersey & New York, and the Chicago & Erie, and H. M. Andrews has been appointed general land and tax agent, succeeding Harrison Williams, resigned, both with headquarters at New York.

OBITUARY.

George E. Chase, Southwestern passenger agent of the Chicago, Milwaukee & St. Paul at Kansas City, Mo., died on May 3, aged 45 years.

G. Asheton Carson, president of the Catawissa Railroad, a subsidiary of the Philadelphia & Reading, died recently at Philadelphia, Pa., at the age of 66.

Maurice Dunnean, roadmaster of the Chicago, Rock Island & Pacific, at Goodland, Kan., was killed when a work train was wrecked near Colby, Kan., on May 1.

J. C. McCabe, general freight agent of the Chicago, Rock Island & Gulf, with headquarters at Ft. Worth, Tex., died in that city on May 3, aged 61 years. He began railway work in 1876 and had been connected with the Rock Island system since 1881, successively as traveling freight agent, commercial agent and second assistant freight agent of the Chicago, Rock Island & Pacific, general freight agent of the Chicago, Rock Island & Texas, and since December, 1903, general freight agent of the Chicago, Rock Island & Gulf.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

THE VANDALIA has ordered 4 Pacific type locomotives from the American Locomotive Company.

THE SOUTHERN PACIFIC has ordered 5 mikado locomotives from the Baldwin Locomotive Works.

THE SEABOARD AIR LINE, mentioned in the *Railway Age Gazette* of May 2 as having ordered 40 Pacific type locomotives from the American Locomotive Company and 5 switching locomotives from the Baldwin Locomotive Works, has ordered 35 freight Pacific type locomotives and 7 passenger Pacific type locomotives from the American Locomotive Company, and 5 switching locomotives and 1 dummy motor from the Baldwin Locomotive Works.

THE ATLANTA & WEST POINT has ordered 2 Pacific type locomotives and 1 six-wheel switching locomotive from the American Locomotive Company. The Pacific type locomotives will be equipped with superheaters and will have 24 in. x 28 in. cylinders, 73 in. driving wheels, and in working order will weigh 257,000 lbs. The six-wheel switching locomotive will have 19 in. x 24 in. cylinders, 52 in. driving wheels and in working order will weigh 119,000 lbs.

THE BESSEMER & LAKE ERIE has ordered 8 consolidation locomotives and 4 Pacific type locomotives from the American Locomotive Company, and 2 consolidation locomotives from the Baldwin Locomotive Works. The eight consolidation locomotives will have 22 in. x 30 in. cylinders, 54 in. driving wheels and in working order will weigh 205,000 lbs. The Pacific type locomotives will be equipped with superheaters, will have 24 in. x 28 in. cylinders, 73 in. driving wheels and in working order will weigh 232,000 lbs.

THE NEW YORK CENTRAL LINES have ordered 35 mikado locomotives, 33 Pacific type locomotives, 23 eight-wheel switching locomotives, 20 six-wheel switching locomotives and 3 Mallet (0-8-8-0) locomotives from the American Locomotive Company, and 10 six-wheel switching locomotives from the Baldwin Locomotive Works. These locomotives will be allotted as follows: New York Central & Hudson River, 20 Pacific type locomotives; Lake Shore & Michigan Southern, 20 eight-wheel switching locomotives, 5 Pacific type locomotives and 3 Mallet locomotives; Michigan Central, 25 mikado locomotives, 20 six-wheel switching locomotives, 8 Pacific type locomotives and the 10 Baldwin switching locomotives; Cleveland, Cincinnati, Chicago & St. Louis, 10 mikado locomotives; Toledo & Ohio Central, 3 eight-wheel switching locomotives.

CAR BUILDING.

THE CHARLOTTE HARBOR & NORTHERN is in the market for 35 phosphate cars.

THE HAVANA CENTRAL has ordered 50 gondola cars from the Pressed Steel Car Company.

IRON AND STEEL.

GENERAL CONDITIONS IN STEEL.—The steel companies are receiving new business at the rate of between 75 and 80 per cent. of actual production. A further reduction in the volume of unfilled tonnage in the current month is therefore expected unless the buying movement shows a decided improvement within the next two or three weeks. As the mills are still operating at almost their full capacity, the steel manufacturers are not disposed to make any reductions in prices to stimulate the buying movement. Consumers are holding off in expectation of lower prices when a large percentage of the orders now on the books has been worked off. The orders on the books at present are sufficient to keep the mills operating at their present rate for the next five or six months. The earnings in the current quarters should be larger than in the first quarter, as the average price on steel deliveries will be slightly higher.

Supply Trade News.

The Standard Coupler Company, 2 Rector street, New York, has moved its general offices to 30 Church street, New York.

George W. Craven, manager of the Chicago office of the C. & C. Electric Company, New York, has been made manager of the welding department of that company, with headquarters at Garwood, N. J., succeeding George A. Hills, resigned.

The firm of Burton W. Mudge & Co., railroad supplies, of Chicago, has changed its name to Mudge & Company, railroad specialties, and the general offices in Chicago have been removed from the Peoples Gas building to the Railway Exchange.

W. S. Murray has resigned as electrical engineer of the New York, New Haven & Hartford, and has formed a partnership with E. H. McHenry, who recently resigned as vice-president of the New Haven, under the firm name of McHenry & Murray, engineers. The firm will specialize in railway electrification work, including plans, estimates, construction and operation, and will handle work of this character for the New Haven.

The Davis Brake Beam Company has been formed by H. H. Weaver, of Johnstown, Pa., and his associates, and has taken over the control of the Davis Solid Truss Brake Beam Company, Wilmington, Del., maker of the Davis solid truss brake beam, pressed steel journal box lids and other railroad specialties. As soon as a suitable site is secured, the works will be brought to the Pittsburgh district, possibly some place near Johnstown. The new plant will be considerably larger than the present one. F. R. Weaver is manager.

Adolphus Bonzano, pioneer bridge builder and inventor of the Bonzano rail joint and other railroad appliances, died at his home in Philadelphia, Pa., on May 5, at the age of 83. His death was directly attributable to a serious fall sustained by him about two months ago. Mr. Bonzano was born at Ehingen, Germany, on December 5, 1830. He received a classical and engineering education, both at Ehingen and at Stuttgart, Germany. In 1850 he went to Philadelphia, Pa., to perfect himself in the study of the English language. In 1851 he went to Springfield, Mass., where for the following four years he served as apprentice, machinist and draftsman for the American Machine Works. In 1855 he went to New Orleans, La., to take charge of the erection of engines and other machinery. After a short time he went to Detroit, Mich., where he was engaged until 1860 as superintendent of the Detroit Dry Dock Iron Works, which was later transformed into the Detroit Bridge & Iron Works, one of the earliest bridge building plants in this country, of which Mr. Bonzano, was appointed superintendent of construction. In 1868 he went to Phoenixville, Pa., where with Thomas Curtis Clarke and others, he formed the firm of Kellogg, Clarke & Company, bridge builders. Mr. Bonzano was a member of this firm and also chief engineer. In 1870, the firm was succeeded by Clarke, Reeves & Company, Mr. Bonzano continuing as chief engineer. In 1884, this firm was dissolved and was succeeded by the Phoenix Bridge Company, of which Mr. Bonzano was made vice-president and chief engineer. In 1893 he resigned this position and opened an office in New York with T. C. Clarke as consulting engineers. After the death of Mr. Clarke in 1898, Mr. Bonzano retired from active business to devote himself to the invention of railroad and other appliances. Among the most prominent bridges designed by Mr. Bonzano are the Pecos viaduct on the Southern Pacific in Texas, the Kinzua viaduct on the Erie and the Chesapeake & Ohio bridge at Cincinnati.

Adolphus Bonzano.

Railway Construction.

Alabama, Florida & Southern.—This road is now in operation from Ardilla, Ga., on the Atlantic coast line south to Malone, Fla., 15 miles.

Beloit, Clinton & Delavan Interurban.—An officer writes that contracts will be let soon to build from Beloit, Wis., northeast through Shopiere, Clinton, Allen's Grove and Darien to Delavan, 22½ miles. About one-half of the right of way has been secured. There will be two steel bridges about 100 ft. long, also a power house. The company has under consideration the question of constructing a dam to secure water power. Charles F. Lathers, Beloit, may be addressed.

Benewah Valley.—An officer writes that the plans call for building from a point on the Chicago, Milwaukee & St. Paul at St. Maries, Idaho, southwest to Desmet, about 25 miles. The prospects of building the line are good, but it has not yet been decided when contracts for the work will be let. Maximum grades will be 2 1/10 per cent., and maximum curvature 16 deg. Maurite I. Parker, St. Maries, may be addressed.

Canadian Northern.—An officer writes that a 4.15-mile spur is proposed to be built for the Manitoba Gypsum Company at mile 111.89 on the Oak Point branch in Manitoba. (April 18, p. 925.)

Chicago & Alton.—Work has just been started on some heavy grade reduction between Atlanta and Lawndale, Ill. The work includes the handling of about 1,000,000 cu. yds. of earth and will be done with company forces.

Clay Line.—Incorporated in Alberta, to build a railway from sec. 2, tp. 11, range 6, northerly to sec. 2, tp. 12, range 6, west of the 4th meridian, thence to Medicine Hat, Alta. The provisional directors include: H. O. Knowles, S. G. Bannan, L. Hunt, Medicine Hat.

Dominion North Western.—The Canadian government has incorporated this company to build from Regina, Sask., west to Tuxford, on the Canadian Pacific, thence to Red Deer, Alta., with a branch through Battleford, Sask., to Fort McKay. M. J. O'Connor, Ottawa, Ont., is interested in the project. (December 20, p. 1235.)

Houston & Texas Central.—Work on the cut-off building from Stone City, Tex., southwest to Giddings, about 40 miles, it is expected will be finished and the line opened for traffic in a few weeks. (September 20, p. 559.)

Intermarine Railway & Navigation Company.—An officer writes that the prospects of building this line are good and that bids will probably be let in the spring of 1914. The projected route is from a point near the head of Lake Winnipeg, Man., northeasterly 122 miles to a junction with the Dominion government railway to Hudson bay, at mile 191 from Pas. The company expects to use both steam and electricity for the motive power, and to develop a traffic in grain, timber, fish, furs and merchandise. W. S. Boyd, acting secretary, 715 Somerset Block, Winnipeg. (April 25, page 973.)

Lehigh Valley Transit Company.—This company is planning to construct cut-offs and make other improvements to reduce the running time from Allentown, Pa., to Philadelphia. Bids have just been asked for double-tracking a 14-mile section from Lansdale north to Soudertown. Work is now under way on the construction of the $500,000 high-level concrete bridge to connect Allentown with South Allentown. It is expected that the bridge will be ready for operation some time during this coming fall.

Lorain, Ashland & Southern.—This company has given a contract to McArthur Bros. for the completion of the 65-mile line from Ashland, Ohio, to Custaloga on the Ft. Wayne line of the Pennsylvania Railroad, with a belt line 8½ miles long in Lorain. The contract is for a section of 23 miles. The remaining 42 miles is already in operation. Bonds will be issued to cover the cost of the new construction, which it is expected will be finished by October 1. Joseph Ramsey, Jr., president. (January 10, p. 87.)

Menzies Bay Railway.—This company, which is a subsidiary of the Ross McLaren Lumber Company, Vancouver, B. C., pro-

pose to build a railway on Vancouver Island, to open up its timber lands.

NEW YORK CENTRAL & HUDSON RIVER.—An officer writes that grading work is now under way for five miles of double track on the Pennsylvania division near Lawrenceville, Pa. It is expected that the track laying will be carried out in July.

NORTHERN PACIFIC.—According to press reports surveys have been made for a line from East Grand Forks, Minn., north to Drayton, N. Dak.

OREGON ELECTRIC.—An extension of this road from Gray, Ore., west to Corvallis, 5 miles, has been opened for business.

OREGON-WASHINGTON RAILROAD & NAVIGATION COMPANY.—An officer writes that the Oregon Eastern, on which work was started some time ago, has track laid on 36.73 miles of the first section of 80 miles building from Vale, Ore., west. The Utah Construction Company, Ogden, Utah, has the contract. The plans call for building from Vale via Harper, Junctura, and Riverside to Arden, 140 miles; from Arden west to Odell (or Crescent), 147 miles additional has been located. There will be 19 steel bridges having a total length of 4,835 ft. and 72 trestles, also two tunnels to have a total length of 2,618 ft. At Harper a station is to be built. (See Oregon Short Line, January 19, 1912, p. 132.)

OREGON EASTERN.—See Oregon-Washington Railroad & Navigation Company.

PEORIA, CANTON & GALESBURG.—Incorporated in Illinois with $2,000,000 capital stock. The plans call for building from Peoria, Ill., west to Farmington, 25 miles, and thence northwest to Galesburg, an additional 25 miles. The directors include J. A. Lyon, H. Clark, W. B. Coleman, G. C. Powers and G. T. Page.

PRYOR-SALINA & EASTERN (Electric).—We are told that a line will be built from Pryor creek, Okla., east to Salina and to Locust grove, about 22 miles, but it has not yet been definitely decided when contracts will be let. There will be one steel bridge. The company expects to develop a traffic in hay, fruit, farm and dairy products. J. A. Quinn, Pryor, is the promoter. (See Oklahoma Roads, May 2, p. 1013.)

SAN ANTONIO, UVALDE & GULF.—The Pleasanton, Campbellton sub-division has been extended from Campbellton, Tex., to Whitsett, 8.2 miles. (April 11, p. 863.)

SAN LUIS CENTRAL.—An officer writes that the plans call for building from Monte Vista, Colo., north to Center, 12 miles. A grading contract has been given to A. H. Smith, Pueblo, Colo., and the work is now under way. Track has been laid on one mile. There will be about eight small bridges and several culverts. The R. E. McGiegar Construction Company, Monte Vista, are the engineers. The plans include building a station and a roundhouse. The company expects to develop a traffic in sugar beets, potatoes, live stock and other farm products.

TEXAS ROADS (Electric).—Financial support is said to have been secured to build a line from Texarkana, Tex., west via New Boston and DeKalb to Clarksville, about 60 miles. F. W. Offenhauser and associates of Texarkana are back of the project.

ULSTER & DELAWARE.—The right of way of the line between Cold Brook, N. Y., and Stony Hollow, about 14 miles, having been taken by the State of New York for the New York City water supply, the line of the railroad has been relocated to the northward. The relocated line will be put in operation June 1; with the following new stations: Woodstock, 10.15 miles from Kingston Point, and Ashokan, 16.17 miles from Kingston Point. The stations abandoned are West Hurley, Olive Branch, Brown's, Brodhead's Bridge, Shokan and Boiceville.

VIRGINIA-CAROLINA.—An officer writes that contracts were to be let on May 5, and the work started at once on a 40-mile extension in addition to the 8 miles for which a contract was let in December of last year to the Callahan Construction Company, Knoxville, Tenn. The plans call for building from a point in Washington county, Va., near the mouth of Green Cove creek, southeast through Ashe county, N. C., to Jefferson, thence southwest to Todd. The company expects to develop a traffic in lumber, iron ore and fruit. (April 25, p. 974.)

VIRGINIA ROADS.—An officer of the Lyndhurst Lumber Corporation, Richmond, Va., writes that work is under way on a line from Lipscomb, Va., on the Norfolk & Western southeast via Sherando to a point beyond that place. The company is carrying out the work with its own men, and about 2.75 miles of track has been laid. G. S. Briggs, president.

WATERLOO, CEDAR FALLS & NORTHERN (Electric).—An officer writes that the company is building from Waterloo, Iowa, to Urbana in the same state, and 17 miles of this line between Waterloo and LaPorte City has already been constructed and is now in operation. The 20 miles from LaPorte City to Urbana is under construction, and the company expects to lay track on this section during July and August. R. A. Elzy, Marshalltown, has the contract for the grading work. The Gould Construction Company, Davenport, has the contracts for wooden and concrete bridges and the Sims Wet Process Concrete Company, Cedar Falls, has a contract for the fencing. The track laying is being carried out by the company's men. The first 24 miles is along the Cedar river valley; the maximum grade being .3 to 1 per cent., and on the balance of the line it will be 1 per cent. equated for curvature. The grading work involves handling about 15,000 cu. yds. a mile, about 4 miles of the line being rock work. The maximum curvature is 5 deg. There will be about 17 creosoted ballasted deck pile trestles, 20 concrete bridges and culverts, varying from small box culverts to a nine span concrete arch bridge 630 ft. long over the Cedar river. The company has finished work on a six span arch bridge 420 ft. long over the same river near Waterloo. The most important station is at LaPorte City, and other station buildings include brick structures, 22 ft. x 100 ft., containing sub-station, office, waiting and freight rooms. (November 29, p. 1064.)

RAILWAY STRUCTURES.

ALLENTOWN, PA.—See Lehigh Valley Transit Company under Railway Construction.

BLOOMINGTON, ILL.—The Chicago & Alton has appropriated $987,000 for the erection of new shops at this point. This is in connection with an extensive program of improvements at Bloomington, a part of which has already been completed. A roundhouse and additional yards have been built, a passenger station is now under construction, and additional yard tracks are contemplated.

SUDBURY JUNCTION, ONT.—An officer of the Canadian Northern Ontario writes that contracts have been given to Foley Bros., Cincinnati, Ohio, for the concrete substructures, and to the Canada Foundry Company, Toronto, Ont., for fabricating and erecting the steel superstructures of the following deck plate girder bridges: Over first crossing of Goose river, 80-ft. span, to cost $14,080; second crossing of the same river at mile 171.7 from Sudbury Junction, two 60-ft. spans, to cost $14,128; Kabinakagami river at mile 286, one 40-ft., one 50-ft., and three 70-ft. spans, to cost $37,950, and over Little Jackfish river, half-through girder, 63-ft. span, to cost $12,511. The paint used on the bridges was: Shop coat, Sherwin Williams' Metallastic brown, and field coats, Wasatch structural. (February 21, p. 374.)

TORONTO, ONT.—An officer of the Canadian Pacific writes that in connection with the grade separation work at North Toronto, the company is building a five track viaduct about three and a half miles long, including new terminals, etc. At the present time five subways are under construction by contract, and five additional subways will probably be under construction soon, also the erection of the new union station at Yonge street. The work is being carried out jointly for the Canadian Pacific and the Canadian Northern. (March 7, p. 461.)

VAN BUREN, MAINE.—Application is being made to the Canadian parliament to vest in the Van Buren Bridge Company, which has been incorporated in the state of Maine, the charter rights of the Restigouche & Western Railway (now the International Railway of New Brunswick), to build a bridge over the St. John river, between St. Leonards, New Brunswick, and Van Buren, Maine. A. E. McKenzie, Campbellton, N. B., is solicitor for the applicants. (January 24, p. 191.)

WATERLOO, IOWA.—See Waterloo, Cedar Falls & Northern under Railway Construction.

Railway Financial News

Ann Arbor.—J. S. Bache & Company, New York, and others have purchased $750,000 one year 6 per cent. notes dated May 1. These notes are secured by $1,250,000 5 per cent. extension and improvement bonds and by 465 steel-underframe box cars and other property. The proceeds of the notes were used to retire $600,000 notes and $23,000 equipment obligations due May 1, and the remaining $127,000 will be used for general purposes.

Boston & Maine.—The directors have postponed until June any action regarding a dividend on the common stock.

Canadian Northern.—This company and its subsidiary, the Canadian Northern Branch Lines Company, will on June 2 apply to the Canadian railway commission for a recommendation to the governor general for the sanction of the amalgamation of the two companies.

Canadian Northern Branch Lines Company.—See Canadian Northern.

Cassville & Western.—This property will be sold at auction in Cassville, Mo., on May 17; upset price $45,000. The road runs from Cassville to Exeter, Mo., 4½ miles.

Denver & Salt Lake.—See Denver, Northwestern & Pacific.

Denver, Laramie & Northwestern.—Judge Allen in the district court on April 17 denied the petition of the Electrical Properties Company for an injunction restraining the sale of $254,000 of the company's bonds deposited as collateral. The court stated that the company may soon be solvent and the interests of the stockholders and bondholders should be protected.

Denver, Northwestern & Pacific.—This property was sold to the reorganization committee for $3,000,000, the upset price, at the foreclosure sale in Denver on April 28. It has subsequently been turned over to the new company, the Denver & Salt Lake.

Erie.—Application will soon be made for permission to issue $5,000,000 equipment certificates.

Grand Trunk Pacific.—This company recently offered in London £2,000,000 ($10,000,000) 4 per cent. debenture stock at 87 through Glyn, Mills, Currie & Company. This stock ranks on an equal basis with the £5,136,980 ($25,684,900) 4 per cent. debenture stock outstanding.

Hudson & Manhattan.—Application will be made to the New York Public Service Commission, First district, for permission to make two proposed mortgages, one to the Central Trust Company, New York, as trustee, to be known as the first lien and refunding mortgage, and the other to the Guaranty Trust Company, New York, as trustee, to be known as the adjustment income mortgage. The first lien and refunding mortgage is to secure a bond issue not exceeding $65,000,000, and the adjustment income mortgage is to secure an issue of bonds not exceeding $33,574,000. All of the adjustment income bonds and $37,035,000 of the first lien bonds are to be issued at once. The proceeds will be used to acquire $67,148,000, 4½ per cent. first mortgage bonds and for general purposes.

Interborough Rapid Transit.—An extra dividend of 2 per cent. has been declared on the stock.

Laramie, Hahns Peak & Pacific.—The bondholders protective committee, of which Alexander J. Hemphill is chairman and Lewis B. Franklin, 140 Broadway, is secretary, has issued a circular dated April 24, 1913, urging the holders of the first mortgage bonds, not to deposit such bonds with any committee at present, but to approve an issue of $315,000 receivers' certificates which shall be a first lien on the entire property. The funds which would be derived from this sale are urgently needed for current expenses, new equipment, etc. If this permission is not given, application will be made to the circuit court of appeals, which, in the opinion of the committee's counsel, has power to make these certificates a first lien ahead of all other mortgages, in spite of any objections that may be made. The circular points out that the opposition of the holders of the first mortgage bonds to this issue would only result in a delay of about one year in the issuance of the certificates. The committee will purchase the coupons for interest due January 1, 1913, on all first mortgage bonds, the holders of which consent to this issuance, and also agrees that the coupons so purchased shall be made subordinate in lien to the lien of all future maturing coupons and to the lien of the principal of the bond.

Louisville & Nashville.—Brown Bros. & Company and Potter, Choate & Prentice, both of New York, have sold $6,500,000 equipment series A 5 per cent. certificates at par. These certificates are dated June 1 and will mature in semi-annual installments of $325,000 each from December 1, 1913, to June 1, 1923, inclusive. They are secured by equipment costing $7,226,420.

Pennsylvania Railroad.—See West Jersey & Sea Shore

Pere Marquette.—The U. S. circuit court of appeals for the sixth circuit on April 29 affirmed an order made by the U. S. district court at Detroit in May, 1912, authorizing an issue of $3,500,000 receivers' certificates. The sale of the certificates has not yet been arranged.

Southern Pacific.—See Union Pacific.

Union Pacific.—The Supreme Court on May 5 extended the time in which this company was to dispose of its Southern Pacific stock from May 12 to July 1, thus only partly complying with the request of the Union Pacific attorneys for an indefinite extension of time.

Wabash.—The receivers, acting under the instruction given by Judge Adams in the federal court at St. Louis on April 26, made no provision for the principal or interest of the $5,000,000 4½ per cent. notes due May 1. The committee representing a majority of this issue calls for the deposit of the notes with May coupon attached at U. S. Mortgage & Trust Company, New York. The committee consists of John W. Platten, chairman; Otto T. Bannard and Henry R. Ickesheimer and Calvert Brewer, 65 Cedar street, New York, secretary. The committee has arranged with the depositary to advance to depositing note holders who desire it, the amount of the interest coupon due May 1, 1913.

West Jersey & Sea Shore.—The stockholders have approved the 999 year lease of the property to the Pennsylvania Railroad, that company guaranteeing 6 per cent. dividends on the outstanding stock of the West Jersey & Sea Shore. The lease will take effect July 1, 1913.

Railway Concessions and Speculators in Argentina.—There will be no more railway concessions granted in Argentina to irresponsible speculators—that is to say, to that vast number of individuals who have applied for and been granted concessions for lines which they never had the remotest intention of constructing. The idea has been to put up to a fictitious value the land through which the supposed railway would pass; and therein lies the rich profit of the Argentine speculator. From first to last within the past few years the congress has, upon the recommendation of successive ministers of railways, granted over one thousand different concessions to this undesirable class of exploiter.

Indian Railway Troubles.—The Indian government has been blamed for the late period of the financial year, when the sums allotted to various works are finally determined. This makes it difficult to spend the money in time as far as major orders for materials are concerned. But agents in India, through whom the orders are sent for the great variety of minor articles required on railways, complain that officers leave their orders to the last moment, and then pester the agents with complaints for late deliveries—oblivious, apparently, that their urgent commands are not the only urgent ones that have to be fulfilled by the home manufacturers. This same foresight would remove many of the complaints of car shortage from shippers. If only they would lay in a stock of coal, instead of ordering it in driblets, they would not be disappointed in their deliveries when the railways require their cars to carry wheat and other commodities which pay higher rates, and which, moreover, are perishable.